Final Evaluation of the Energy and Environment Partnership Program in Indonesia (EEP)

Final Report

Abbreviations

BAPPEDA	Regional Development Planning Authority
BAPPENAS	Ministry for National Development Planning
CDM	Clean Development Mechanism
CTA	Chief Technical Advisor
DGNREEC	Directorate-General of New, Renewable Energy and Energy Conservation
EEP	Energy and Environment Partnership
EoF	Embassy of Finland
FIT	Feed In Tariff
GHG	Greenhouse gas
GoF	Government of Finland
GoI	Government of Indonesia
HRBA	Human Rights Based Approach
IBEKA	People Centered Economic and Business Institute
IE	International Expert
LE	Local Expert
LFA	Logical Framework Approach
LPG	Liquefied Petroleum Gas
MDGs	Millennium Development Goals
MEMR	Ministry of Energy and Natural Resources, Indonesia
MFA	Ministry for Foreign Affairs of Finland
MTE	Mid-term evaluation
NC	National Coordinator
NCU	National Coordination Unit
NEC	National Energy Council
NGO	Non-Governmental Organization
PCM	Project Cycle Management
PD	Project Document
PESTEL	Political, Economic, Social, Technological, Environmental and Legal situation
PLN	Perusahaan Listrik Negara, state owned electricity utility
RBM	Results Based Management
RE	Renewable energy
RUED	Integrated Regional Energy Master Plans
SC	Steering Committee
SME	Small and Medium Enterprise
SMK	Secondary technical schools
SVB	Supervisory Board
TA	Technical Assistance
TL	Team Leader
ToR	Terms of Reference

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1. Executive Summary

1.1. The task

The final evaluation of the EEP Indonesia assesses progress towards the objectives of the programme and analyses the reasons explaining success and failure and the sustainability of the programme achievements. It also aims to determine what can be learned from the project.

The programme objectives are related to:

- access by people to renewable sources of energy;
- the substitution of such renewable energy sources for fossil fuels in reducing GHG emissions.

The evaluation aims to produce a judgement of the attainment of the programme objectives in two timeframes: during the programme period and thereafter. The latter indicates sustainability.

The criteria of relevance, development impact and sustainability are relevant to both time periods. Those of efficiency, effectiveness and programme management are related to the implementation period, although they have potential lessons for the future.

Lessons are drawn, which may be useful to EEP in other regions and about programme management more generally.

1.2. Main points of the methodology

The programme aimed to remedy energy access, reduce the growth of GHG emissions, promote energy delivery by both commercial and community bodies and influence policies at least at a regional level. It therefore aimed to achieve policy, economic, social and environmental outcomes.

To meet the requirements of attribution and causality, the evaluation uses a PESTEL framework that involves analysis of the political (P), economic (E), social (S), technological (T), environmental (E) and legal (L) situation. This can take account of all the relevant factors in the evaluation.

Two main methods were used in the evaluation:

- comparison with plan, examining efficiency, effectiveness, impact and management in quantitative and qualitative aspects;
- changes in practices, policies and behaviour, reported by participants in the programme.

Four techniques were used: **semi structured interviews, project visits** to sites, **documentary review** of all relevant programme and project documents, and **quantitative analysis** mainly focussing on outputs (GHG emissions, kWh, people involved) expenditure and timetables.

1.3. Main findings

The Energy and Environment Partnership Programme delivers projects, which can be examples of good practice. Although EEP Indonesia was more restricted than the other EEP, it demonstrated

the validity of the concept.

Several of the projects in EEP Indonesia continue in operation and some are set to deliver greater benefits. One, dealing with human waste to provide energy to a boarding school is now a model promoted by the Ministry of Energy and Mineral Resources (MEMR). Other projects that deal with coconut and palm oil waste show good promise.

However, the short time scale and restriction to two provinces and the one renewable energy domain of bio-energy constrained the programme. It failed to find enough quality project proposals to fund, although strenuous and successful efforts were made to stimulate applications. This included locating support staff in both provinces.

As a result technical delivery in terms of GHG reductions and people involved were well below initial expectations. Some projects either did not deliver or ceased to function after a trial period because of technical, market or social failings, which could have been predicted. The standard for funding applications had been set too low.

Administrative completion seems to have become of overriding importance. There was a high rate of acceptance of project proposals, indicating that the standard was not the highest. Although non selected proposals were not reviewed, the notes of Technical and Steering Committee meetings were and it is highly unlikely that any good proposals were rejected. Programme management had been aware of the problem and made a large effort to increase applications as well as attempts to both enlarge the programme area and programme technologies.

Technical oversight was lacking. Project documents on good practice gave prominence to projects, which were not functioning and fundamentally technically flawed. Predictions were reported as accomplishments.

The Completion Report implicitly accepts that quality of applications was not as high as desired. Allocation of funds was around 95%. However when figures for Greenhouse Gas (GHG) emissions and people involved are examined, they include results from failed projects and those from expected developments arising out of feasibility studies. When these are removed, the figures drop to 5% of target GHG saving.

Monitoring of the projects was not adequate. In addition to failures to record technical progress accurately, there were deficiencies in the reporting of female participation and the involvement of disadvantaged groups. There is effectively no information on the latter and reporting on the involvement of women at all levels was left up to the projects, a minority of which undertook the tasks seriously and successfully.

Good relationships with MEMR and the provinces were maintained along with other stakeholders, who facilitated projects in both provinces.

Given the constraints faced by the programme, a reassessment at early or at least mid term stage was called for and if the programme could not have been extended, it should have been reduced. Clearer reporting and adherence to the achievement of technical outputs would have produced a more efficient programme at lower cost, without any loss in impact.

1.4. Main Recommendations

a) The EEP approach should be continued in other parts of the world as this type of approach, if well managed can produce impacts in line with Finnish policies on reducing poverty, combatting

climate change and involving women.

b) EEP programmes should have greater interaction through regular forums and representatives from other EEP programmes should participate as experts in selection processes and contribute to the Mid Term Review of a programme.

c) When contextual or operational difficulties make programme delivery of an adequate standard impossible, the Technical Assistance (TA) should be required to report this to Supervisory Board (SvB) and such consideration should become part of the normal reporting procedure, a warning of difficulties rather than an indication of failure.

d) Project selection should include minimum quality thresholds for technical and economic viability.

e) Programme management taking into account the specific concerns of the Steering Committee and the experts in monitoring projects and set goals for projects to deal with points of concern.

f) Annual progress reports should include clear sections on the participation of women and disadvantaged groups in the programme. Such recording should be mandatory for all projects supported by EEP. It would also enable an overview of EEP on either a total or comparative basis among programmes.

g) The Mid Term Review of EEP programmes should include the requirement to address the technical performance and competence of the projects being supported.

2. Implementation of the mid-term review

2.1. Brief review of EEP Indonesia

EEP Indonesia is one of a number of Energy and Environment Partnership Programmes supported by the MFA. Others are EEP Mekong, covering five countries in South East Asia, EEP South and East Africa, EEP Andean Region and EEP Central America. EEP Indonesia and EEP Central America terminated in 2014.

Indonesia is one of Asia's largest emitters of greenhouse gases reliant on subsidised fossil fuels. The industry, power, and transport sectors dominate Indonesia's energy-related carbon dioxide emissions. If Indonesia continues on the current energy consumption path, it will release green-house gas emissions that are nearly triple the current amount by 2025.

However the Indonesian government recognizes that there are a lot of largely unutilized potential in renewable energy sources. The National Energy Policy 2014 sets out a target share of 23% of total energy consumption for renewable energy to be reached by 2025.

Remote, rural areas often suffer disadvantages in accessing energy and do so at high prices. According to figures from the Ministry of Energy and Natural Resources, the electrification rate in Central Kalimantan is 45%, which is one of the more remote and poorest provinces. Even in Riau, a richer and more compact province on Sumatra, it is still only 63%. However these figures are subject to dispute as to whether they indicate households or villages, where only a minority of buildings may be connected.

The human rights-based approach (HRBA) of Finnish Development Policy Programme aims address poverty as a multidimensional phenomenon, analysing the root causes of poverty and sharpen the strategies for achieving sustainable poverty eradication. According to the International Energy Authority (Modern Energy for All, 2016) energy services are crucial to human well-being and to a country's economic development. Access to modern energy is essential for the provision of clean water, sanitation and healthcare. The Completion report of EEP Indonesia asserts that HRBA considers access to energy as one of the basic rights of the people and a driver of sustainable development, which is going beyond stated Finnish policy in this regard.

2.1.1. The Programme

According to the Completion Report of the programme, EEP Indonesia, implemented in 2011-2014, contributed to renewable energy, exclusively bioenergy, related capacity building, pilots and demonstration projects and policy development at national and regional levels. The programme at inception aimed to contribute to the achievement of the Millennium Development Goal (MDG) of gender equality and the international climate change mitigation goals.

According to the EEP Indonesia Programme End Assessment (November 2014), it has contributed to the development of Integrated Regional Energy Master Plans in its two target regions Riau and Central Kalimantan, the two target provinces. This was accomplished through an initial project, 'Support for the Regional Energy Planning Process of Riau Province (Rencana Umum Energi Daerah, RUED),' conducted by Yayasan Spektrum Pelangi Indonesia. The project involved the training of representatives from the province of Riau and 12 kabupatens (districts) leading to the production of proposals for the Integrated Regional Energy Master Plans. This was then replicated at a provincial level through a direct contract from the programme to Yayasan Spaktrum Pelangi.

Verification involved interviews with the project deliverer and beneficiaries in Riau province.

The programme aimed to address challenges related to energy security in rural communities and energy related global and local environmental impacts, particularly climate change, in an integrated way. The programme purpose was for a broad range of renewable bio-energy solutions to be adopted in energy related policies and strategies and implemented by public and private actors and local communities in the participating provinces.

The programme objectives were:

- increased access to sustainable renewable energy and
- reduction of the growth rate of GHG emissions in the participating provinces of Indonesia.

Two calls for proposals were implemented and 20 bioenergy projects chosen for the programme. The EEP Indonesia programme ended in December 2014. The total budget for the programme over 2011-2014 was EUR 4.108 Million.

Ownership by beneficiaries, policy support, economic and financial factors, socio-cultural aspects, gender equality, appropriate technology, environmental aspects, and institutional and management capacity were considered in project selection. Sustainability of the projects after external funding ended was also stressed.

The programme beneficiaries include the Ministry of Energy and Mineral Resources of Indonesia, organizations engaged in EEP supported projects, Departments (Dinas offices) of Energy and Mineral Resources in the target provinces, entrepreneurs obtaining income from renewable energy sector and the target provinces' populations.

EEP Indonesia was a joint collaboration between the Government of Indonesia and Government of Finland. It was co-financed by the Ministry for Foreign Affairs of Finland and the Ministry of Energy and Mineral Resources of Indonesia. The implementing agencies were the Directorate of Bioenergy under the Directorate General of New, Renewable Energy and Energy Conservation of the Ministry of Energy and Mineral Resources of Indonesia and the Dinas Offices of Energy and Mineral at the provincial level in Central Kalimantan and Riau.

Supervisory Board and Steering Committee included representatives from the Government of Indonesia and MFA of Finland. Implementing consortium was FCG International Ltd. with local partner IBEKA from Indonesia. The consortium was responsible for the operational implementation of the programme. It reported formally to the Steering Committee, on which the implementing agencies were represented.

2.1.2. The projects

The programme was primarily concerned with supported demonstration, policy and capacity building projects. Between 2011 and September 2014, EEP Indonesia funded 20 projects, twelve projects in Riau Province and six projects in Central Kalimantan Province, with two projects operating in both provinces and at several locations. The projects were:

- Pilot and demonstration projects on bioenergy, also including waste-to-energy applications;
- Pre-feasibility and feasibility studies, CDM preparation;

- Strategic studies for renewable energy development;

- Capacity building/training programs.

Eight projects were led by business enterprises including consulting companies (one enterprise led two projects), ten lead applicants come from national and international NGOs, and two lead applicants come from universities. There were other partners in several of the projects. Total partners of the projects were:

- 8 national NGOs;

- 15 companies including consulting companies;

- 7 universities;

- 2 government institutions;

- 1 boarding school and

- 4 international NGOs.

Links to Finnish organisations were encouraged to enhance technology transfer (Completion Report p29) and Wiltrain Oy was a lead partner in one project and MHG Systems Oy a partner in the same project.

Motiva, a Finnish expert company provided an expert for the evaluation of the project profiles and final project proposals submitted for the EEP finance. Benet Oy in cooperation with Bioenergy Association of Finland organized an international Bioenergy from Forest Conference in Finland in 2012 and Bioenergy 2013 Conference and Exhibition.

Training on formulation of proposals, mainstreaming gender and energy issues and renewable energy business forums were facilitated and Indonesian delegations participated in renewable energy conferences in country and in South East Asia and in Finland. The programme and projects also provided capacity building and training to implementers in order to increase the knowledge and skills of the implementers.

2.2. Purpose as specified in the ToR

The purpose of the final evaluation is to provide an external, independent and objective view, as well as information and assessment, of the EEP Indonesia. The final evaluation is expected to provide a better understanding of what has been achieved and what can be learnt from the project. Evaluation shall also assess progress towards the objectives and analyse the reasons explaining success and failure and the sustainability of the programme achievements.

Attention should particularly be given to analysing, which projects have business development potential and how the potential could be supported and developed further.

The evaluation was based on a desk study of background materials and reports, followed by field visits, interviews of various stakeholders and beneficiaries. The team prepared an evaluation report and the recommendations will be presented in a summarized form and discussed amongst the competent authorities and project partners as appropriate.

The findings and generalized lessons learned from EEP Indonesia final evaluation can be utilized in other EEP programmes as well as in other development cooperation programmes of the MFA.

2.3. Objective of the evaluation

The objective of this evaluation is to produce a judgement of the attainment of the programme objectives (in different aspects) in two timeframes: during the programme period and thereafter. The latter indicates sustainability.

The criteria of relevance, development impact and sustainability are relevant to both time periods. Those of efficiency, effectiveness and programme management are related to the implementation period, although they have potential lessons for the future.

With regard to the future, changes in practices and policies during the programme period are crucially important as, once changed, behaviour has long term effects.

2.4. Methodology used, data collection and analysis

Our approach to the programme took account of the complex situation in which it operated. The complexity results from the interacting and often conflicting forces operating in energy delivery, governance and civil society in Indonesia. At a national level, Indonesian energy policy has to deal with the 'Trilemma' of energy security, access to energy and reducing greenhouse gas emissions (Cunningham, 2012), which are not compatible in the short term and result in contradictory policy instruments and practices. At the level of governance, there has been a shift from centralised government to decentralisation to the provinces, whereby even districts have to produce energy plans, which would then need aggregating. The development of civil society organisations in some provinces is rudimentary and their access to the programme could only be facilitated by central bodies (research and NGO). The programme aimed to remedy energy access, reduce the growth of GHG emissions, promote energy delivery by both commercial and community bodies and influence policies at least at a regional level. It therefore had desired policy, economic, social and environmental outcomes.

To meet the requirements of attribution and causality, we used a PESTEL framework that involves analysis of the political (P), economic (E), social (S), technological (T), environmental (E) and legal (L) situation. This can take account of all the relevant factors in the evaluation. The review of literature above confirms the multi-faceted nature of the context and all the aspects need consideration.

The approach enabled us to break each factor down into relevant questions. These are set out below along with the means used for gaining answers.

Table 1. Questions used in the PESTEL analysis and means of answering them

	Questions	Means for answers
P	What is the political priority given to renewable energy? How are Regional Integrated Master Plans developed and implemented? How has the programme contributed to them?	Government publications and commentaries thereon. Interviews with officials
E	What is the competitive situation of renewable energy vis a vis fossil fuels? What incentives are there for entrepreneurs and communities to enter the market? Has this changed during the programme?	Publications. Interviews with officials and participants.
S	What is the nature of marginal groups vulnerabilities? How do the projects and studies address them? How are women represented in the projects? What changes have resulted? Have rural groups gained access to energy? If so, what were the steps?	Review of literature. Review of programme records. Interviews with participants.
T	What are the predominant technologies in use for renewable energy? How available are they for marginal groups in terms of cost and knowledge? Are there emerging technologies, which have been demonstrated or studied?	Review of literature. Review of programme records. Interviews with participants, officials and experts.
E	What are the changes in GHG emissions? What is the effect on land use? Are there any displacement effects?	Quantification from project records. Interviews with participants and experts.
L	How does the law deal with ownership of energy resources, land and environmental protection? Is it effective? Is this changing?	Government publications. Interviews with officials and experts.

The 20 projects are core to this evaluation. Their achievements are the examples that the programme has tried to highlight. They can be categorised in the following way:

- 5 dealing with plant waste, of which one is a feasibility study;
- 2 dealing with cow manure as fuel source;
- 2 dealing with human, sanitary and domestic waste;
- 3 enabling biogas production technology;
- 2 introducing efficient stoves;
- 6 on capacity building, including training, planning and facilitating decision-making.

2.4.1. The methodology

Methods

Two main methods were used in the evaluation:

- comparison with plan, examining efficiency, effectiveness, impact and management in quantitative and qualitative aspects;
- changes in practices, policies and behaviour, reported by participants in the programme.

Techniques

Four techniques were used.

(**a**) **Semi structured interviews**. These covered

- Ministry of Energy and Mineral Resources (MEMR) of Indonesia (Directorate of Bioenergy);
- Ministry for National Development Planning (BAPPENAS);
- Ministry of Environment;
- Departments (Dinas offices) of Energy and Mineral Resources in the two provinces;
- Regional Development Planning Authority (BAPPEDA) in the two provinces;
- Project partners and participants;
- FCG International Ltd and people formerly involved in the programme.

(**b**) **Project visits** to sites also included interviews with local implementers of EEP financed projects and project beneficiaries (e.g. beneficiaries of realized investments, village representatives where community based initiatives were implemented, teachers and principals of schools).

The distribution of projects according to location and type is shown in the table below. The numbers of site visits or interviews with partners and participants is shown in brackets.

Table 2 Projects by region and visited

Province	Total projects	Type of projects		
		commercial bioenergy solutions	community based initiatives	strategic studies, capacity building
Central Kalimantan	6 (6)	1 (1)	4 (4)	1 (1)
Riau	12 (10)	6 (5)	3 (3)	3 (2)
Both provinces	2 (1)	0	0	2 (1)

(**c**) **Documentary review** of all relevant programme and project documents available to determine feedback, difficulties, unexpected changes, successes and progress.

(**d**) **Quantitative analysis** mainly focussing on outputs (GHG emissions, kWh, people involved) expenditure and timetables.

Data collection

Data was collected in four ways.

- Programme and project reports from MFA, FCG, Government of Indonesia and project partners provide a basis for building up a history of the programme and providing a baseline for quantitative analysis.

- Publications relevant to the programme gathered from on line libraries and other sources.
- Interviews with national officials and experts, including those involved EEP.
- Site visits and interviews with those participating in the project.

2.4.2. Indicators used, benchmarks and comparative reference material

The indicators used were those specified in the programme: renewable energy generation in kWh, GHG emissions in tonnes CO2, beneficiaries in numbers of men and women, expenditure in Euros. These were benchmarked against programme outputs.

The evaluation team scored the projects on a rating of 1 to 4, where 1 is not feasible, 2 is feasible or demonstrated, but with no follow on, 3 is functioning and delivering benefits but without great replication potential, and 4 is functioning, delivering benefits and with considerable replication potential or demonstration. This rating was given on the basis of actual project delivery and not on the difference between delivery and reporting, which has been optimistic.

Reference material was drawn from programme, government and academic publications.

3. Key findings

3.1. Overall achievements of EEP Indonesia

The overall objective and the project purpose of EEP Indonesia is set out below.

Overall objective: *Increased access to sustainable renewable energy and reduced growth rate of GHG emissions in the participating provinces in Indonesia*.

Project purpose: *Broad range of bioenergy solutions adopted in energy related policies and strategies and implemented by public and private actors and local communities in the participating provinces*.

The logical framework set out in the Amended Programme Document defined five *results* (outputs) for EEP Indonesia:

1. Strengthened knowledge base, know-how and institutional collaboration for bioenergy nationally and in the participating provinces;
2. Project developers (potential and actual) have capacity to plan and implement successful bioenergy projects;
3. (Pre)feasibility studies which test project ideas on new approaches, technologies and project ideas on bioenergy to provide sustainable and affordable alternatives for energy supply, strategic studies;
4. Innovative approaches, technologies and project ideas on bioenergy are identified, tested and demonstrated in practice in industrial applications; and
5. Innovative projects contributing to the development of rural communities are implemented by the communities alone or in collaboration with others (community based applications).

3.2. Duration and the budget

EEP Indonesia commenced on 28 March 2011 with the duration of three (3) years to the end of March 2014. The original budget was EUR 4 million. It was extended to the end of 2014. The programme budget was increased to EUR 4,108,208.

The programme followed the original breakdown of the budget closely, and achieved a similarly high degree of realisation in all the main budget lines. These are shown below.

Table 3 Budget allocation and realisation among the main activities

Code	Budget line	allocated budget	Allocation proportions	Total realisation, 2011 - 2014	% Realisation	Realisation proportions
A1.1 - C2.3	Technical assistance	1150701	28.01%	1089430	95.00%	27.78%
C3	Administrative costs	312000	7.59%	297357	96.00%	7.58%
C4.1, 4.2	Steering and Supervisory Board meetings	13000	0.32%	11053	85.02%	0.28%
C4.3, 4.4	Technical committee meetings, evaluation of proposals, M&E & follow up	127105	3.09%	115328	90.73%	2.94%
C 4.5, 4.7	National forum, training & capacity building	219000	5.33%	206470	94.28%	5.26%
C4.6	Strategic studies	85000	2.07%	84367	99.26%	2.15%
C5	Project execution	2201397	53.59%	2118268	96.00%	54.01%
	Totals	4108203		3922273	95.47%	

The only budget lines to fall below 90% were the small amount of funds allocated to support Steering Committee and Supervisory Board meetings. These were re-allocated to delivery activities during the programme period. Overall the programme had a realisation of just short of 95.5% of budget allocated, with a slightly higher percentage in delivery activities than in technical assistance, administration and management. In the programme 61% of the budget was allocated to delivery activities (C4.5 – C5), which accounted for 61.42% of realisation. In the experience of the evaluation team, this is counter to the typical situation, where the reverse occurs and, at first sight, must be commended. It is typical, in the programmes reviewed by the evaluation team for the TA to spend close to its full budget and for delivery to lag behind its targets. This is because the TA budget is largely spent on staff contracted throughout the programme and therefore easier to manage and disburse. Spending the delivery budget gets held up because of many operational reasons, delays in applications, construction problems, project failures and other factors. Therefore, it is unusual to find a programme, where the reverse occurs, if only by a small amount.

3.3. How activities contributed to project objectives

In line with the priorities of all EEP programmes its core activity was the stimulation and implementation of innovative energy projects, which respected environmental sustainability. The concept 'innovative' was taken to mean that the project was (a) based on the utilization of a new (in the Province) energy source, (b) involved innovation in terms of technology, or (c) presented an innovative solution to make a piloted technology commercially available on a wider scale.

EEP Indonesia also directly financed and organized strategic studies, seminars, investor forums, study tours and other stakeholder capacity building.

There were three components to delivery:

- Projects, which took up almost 88% of the delivery budget (over 54% of the overall budget)

- Training & capacity building, which took up 8.5% of the delivery budget
- Strategic studies, which took up 3.5% of the delivery budget.

However the projects include four, which focused on training and capacity building, and two, which were strategic studies. Taking these into account, the breakdown of the delivery part of the budget can be reformulated by type of activity, rather than budget heading.

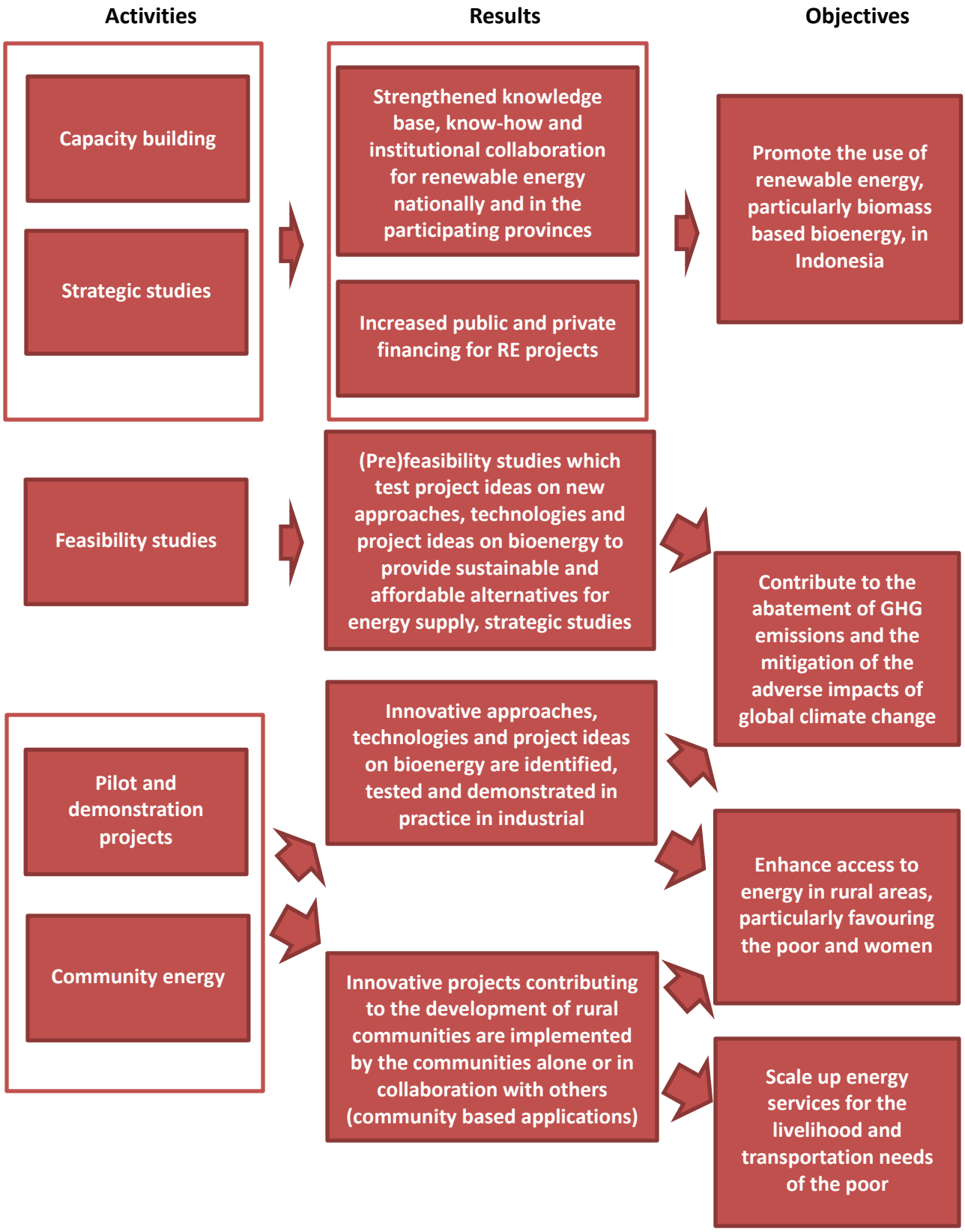
Table 4 Delivery activities broken down by activity.

Activity	Number of projects	Project budget (EEP contribution)	Central programme budget	Total budget	Percentage of delivery
Capacity building	4	507179	219000	726179	30
Strategic studies	2	235100	85000	320100	13
Pilot and demonstration projects	6	646501		646501	27
Community energy (not included above)	5	413217		413217	17
Feasibility studies	3	316271		316271	13
Total	20		2409105		100

Thus capacity building and strategic studies make up a larger proportion of programme activities than is indicated by budget lines. Nevertheless, demonstration projects and feasibility studies for energy delivery remain the majority of delivery spending.

This breakdown provides a good alignment to EEP Indonesia's objectives stated in the project document.

Figure 1 Links between activities, programme objectives and results



The above table is a simplification, showing the main links. A good community energy project will also promote renewable energy use and contribute to the abatement of GHG.

The results are specified with indicators from the logical framework. They are dealt with later on in the document and so form a means of assessing the achievement of the objectives.

With 88% of the delivery budget, the projects are crucial to the evaluation of the programme and its results. This is all the more so given the overlap in the areas of capacity building and studies. For example Yayasan Spektrum Pelangi Indonesia was contracted centrally to replicate its support for the regional process conducted in Riau to be repeated in Central Kalimantan. When participants were interviewed they often commented on the training given, but were unaware of which budget line had funded the events they attended. In the above list of objectives, one was not pursued: services for the transportation needs of the poor.

3.4. Projects

Projects can be categorised as demonstration projects (DP) showing physical demonstration of the technology, feasibility studies (FS) usually also producing a plan for implementation, community energy projects (CE), which in two cases involved distribution of cookstoves to households, capacity building (CB), which involved training and development of support structures and strategic studies (SS). Some projects fell into more than one category. Community energy projects typically involved physical demonstrations.

There were two calls for proposals and financing was distributed to twenty (20) projects implemented in the target provinces.

The projects supported are set out in the table below, which is drawn from the Completion Report of the programme.

Table 5 Projects financed by EEP Indonesia by category

Project type	Project developers' own contribution, EUR	Project developers' own contribution, %	Total EEP finance, EUR	Total project cost, EUR
PILOTS/DEMONSTRATIONS AND FEASIBILITY STUDIES IN TOTAL (14 projects)	516 674	27 %	1 375 989	1 892 663
CAPACITY BUILDING, STRATEGIC STUDIES (6 projects)	392 156	35 %	742 279	1 134 435
GRANT TOTAL	908 830	30 %	2 118 268	3 027 098

Total implementation costs of the projects: €3,027,098, of which EEP project financing covered €2,118,268. This is close to envisaged €2,248,299 in the programme document and represents an implementation rate of over 94%[1]. This is in spite of the difficulty of gaining enough quality proposals in the first round, when only five were funded. A further 15 were supported in the second round. The evaluation team have visited the sites of the majority of the projects or

1 These figures are drawn from page 10 of the Completion Report and differ slightly from those in table 4.1 on page 26 of the report.

interviewed project partners and participants, usually both.

The projects have been implemented. However, not all have been completed and there are shortfalls in the observed outputs, which in some cases have been large. The status of the projects is shown at the time of the evaluation is shown in the table below.

Table 6 Status of Supported Projects at Time of Evaluation

	Project description	Lead applicant	Type	Region	Status at evaluation				
					non viable	not functioning	un-checked	progressing	replicable
1	Biogas from human manure	LKM Harapan Madani	DP	R					O
2	Dual chamber gasifier	PT Dyna Energy	DP	R	O				
3	Biogas from sago starch	SaraRasa Biomass Pte. Ltd.	FS & DP	R		O			
4	Biomass Power Production in Central Kalimantan	PT STC Indonesia	FS &DP	K					O
5	Cow manure for biogas	Yayasan Bina Usaha Lingkungan (YBUL)	CE & DP	R				O	
6	Production of Biogas from Farming Wastes	Yayasan Eka Mandiri	CE & DP	K		O			
7	Electricity from Palm Oil effluent	South Pole Carbon Asset Management Ltd	FS	R					O
8	Sanitary landfill gas	Universitas Indonesia	FS	R	O				
9	Palm oil waste streams	PT STC Indonesia	FS	R				O	
10	Integrated biogas energy	Yapeka with Yayorin	CE	K				O	
11	Communal biogas from cow manure Suka Maju Women	Institute Social and Economic Change (ISEC)	CE	R				O	
12	Medium Scale Biogas Digester	SNV	CE	K				O	
13	Biomass Stove and Fuel	Yayasan INOTEK	CE	K		O			
14	Biomass stoves Riau	MAGROVE INDRAGIRI	CE	R		O			
15	Regional Energy Planning Process of Riau Province	Yayasan Spektrum Pelangi Indonesia	CB	R				O	

	Project description	Lead applicant	Type	Region	Status at evaluation				
					non viable	not functioning	un-checked	progressing	replicable
16	Renewable energy clearing house in Riau Province	Suska Riau University (EnReach)	CB	R				O	
17	Investment Facilitation for RE Project Developers, Palm Oil Plantations & Financiers	PT The Apex Group Consulting - New Ventures Indonesia	CB	B			O		
18	Teaching biomass technologies	ETC Foundation	CB	B				O	
19	Redeemable Biomass Electricity Credits	Sinclair Knight Merz Ltd	SS	R		O			
20	Platform & database	Wiltrain Oy	SS	K		O			
	TOTALS		**20**		**2**	**6**	**1**	**8**	**3**

DP = Demonstration Project, FS = Feasibility Study, CE = Community Energy, CB = Capacity Building, SS = Strategic Study

The projects described

Below follows descriptions of the projects funded by EEP Indonesia. They are described by type. Annex 6 contains more details and their responses to the questions asked by the Evaluation Team.

3.4.1. Pilot Projects

There were two purely pilot projects, which present completely different stories and could not have been further away from each other in performance.

1 Integrated Biogas Development of Human Manure and Domestic Waste in Dar El Hikmah Boarding School in Pekanbaru, Riau

This project was led by LKM Harapan Madani in cooperation with Yayasan LPTP (Lembaga Pengembangan Teknologi Pedesaan) and Dar El Hikmah Boarding School, Pekanbaru, where all the development work has taken place.

The project involved generating biogas for cooking from human and other waste. This was a very successful project, which has the following characteristics.

- Project solved 50% of challenging human waste treatment problem at school
- LPG cooking cost savings significant in a highly competitive Islamic Board school market environment
- Excellent local project management

- Effective awareness raising and social mobilisation
- Technically sound & reliable digesters & waste water treatment plant running
- Highly motivated advisor trained & retained at school
- 14 month start to finish project timeframe is impressive
- Around 40 tonnes/CO2e year GHG savings (not 16,600 tonnes/CO2 as claimed)
- Project would like to add another 3 digesters for 100% site coverage
- MEMR now funding replications around Indonesia, large number of sites possible
- Excellent value for money for €97,000 EEP support
- Won ACE ASEAN Award, a real new innovation, replication already underway

2 Dual chamber gasifier for gas fuel production from biomass

This project was led by PT Dyna energy in cooperation with the Badan Permusyawaratan Desa (village) in Siak region, Riau province.

The project concept suffered from multiple, predictable, and fundamental technical, scale up, ownership and business model and financial flaws that would have prevented it from ever operating properly, let alone sustainably. Nevertheless, the project was the single largest EEP funded project and was presented as the best EEP project result in Indonesia in project literature and it was the first EEP site that the new Finnish Ambassador was taken to visit. The following are the most salient points concerning the project.

- The scale up from a laboratory test of 1kW to 500kW in one bound was unrealistic and reservations were noted at selection stage. However, these were too mild.
- It was not realistic to build a gasifier that is supposed to use (unknown) biomass waste materials without the necessary on-site specific biomass waste pre-treatment area and equipment. However, no biomass pre-treatment equipment was on site when it was visited. There was also no apparent biomass feedstock mechanical feeding equipment for the gasifier on site to feed the necessary one tonne per hour of material into one completed gasifier for its 500 kW output. There was no gasifier ash storage area on site (for the about one tonne per day of ash that would be produced at 1 MW output levels).
- The gasifier site did not have the necessary 500 kW electrical dump load which would be required to test the claimed 500 kW gasifier-diesel engine combination at full output power levels - the electricity produced would have to go somewhere. The gasifier system could never have been run and commissioned as claimed in the project literature, even if a suitable 500kW diesel engine had been borrowed for test purposes, and it is not clear that this 500kW diesel engine test happened anyway.
- The nearest PLN grid was only 7km away when the specific project installation was started, and it would have been 90% cheaper to connect the proposed villages to the nearest PLN grid instead of installing a new local gasifier-diesel power plant.
- There was no interconnection agreement apparently even discussed for PLN to buy the power plant's electricity in the nearly inevitable case that the PLN grid was extended by to the actual site (PLN subsequently extended the grid to the gasifier's actual site's location in 2015).
- The project was completely underfunded when gasifier construction started; it

lacked a proven working gasifier technology at the required scale; it lacked a clearly defined specific biomass fuel to gasify in testing and use; it had no suitable sized diesel engines available, and the developer lacked the necessary wide range of skills required to complete the project, let alone operate it sustainably.

- The October - November 2014 project write ups claimed that the 1st gasifier unit had been installed and commissioned, but this is hard to believe with the unfinished plant that was clearly visible on site during the evaluation mission. It is hard to imagine that anyone from the EEP project adequately checked on site regarding this allegedly installed and commissioned (500 kW) gasifier-diesel claim.

3.4.2. Pilot projects as part of feasibility studies or community energy developments

There were two feasibility studies, which involved pilot elements and two community energy projects, which were effectively pilot projects. These are presented below. There are two qualified successes, which are either delivering in part or likely to and two, which have no impact after the project period.

3 Feasibility Study: Creating Biogas from the Sago Starch Industry's Waste Water and Biomass

The project aimed at the replacement of electricity generated by diesel with electricity generated by biogas in an industrial process by utilizing waste water from sago starch factories for biogas production and reduction of environmental burden caused by untreated waste waters of these sago starch factories. The project output plan was to prepare a feasibility study of biogas and the development of biogas pilot plant. This has not produced a sustainable result. The project had the following characteristics.

- SaraRasa Biomass Pte. Ltd (based in Singapore) is executor (lead applicant), with local partner Starch Mill (Kilang Sagu Maju Jaya, Selat Panjang). PT Sara Rasa owns a pellet business with raw material of sago bark.
- A reactor digester with a capacity of 30 m^3 was installed. Biogas was used for electricity generation, and used for cooking. But, the biogas produced was less than expected. The barrier was the lack of clean water during dry season, so that the mill used sea water. This has resulted in the death of bacteria for producing biogas. There was also a lack of a continuity of acceptable raw material. Animal farms are rarely found in the area so that starter bacteria are difficult to obtain. Biogas is no longer in use. This project is impractical because of location.

4 Feasibility Study: Business development for integrated biomass power production in Central Kalimantan

This project was led by PT Sustainable Trade and Consulting, in cooperation with Indonesia PT Forest Carbon Consultants, Maris Projects, BV, PT Dian NiagaJakarta and Yayasan Dian Tama. The latter were locally based and the consultants based in Java.

The purpose of the study was to devise a comprehensive model to construct a multiple waste stream bioenergy production facility with integrated heat recovery for power production which avoids emissions of 25,000 tonnes of CO2 equivalent from burning or decomposing agricultural wastes and produces 5-10 MW of electricity while increasing income for 500 local people. Beyond producing the technical design based on proven technologies, the STC Consortium aims to increase the capacity of upstream biomass suppliers to secure 54,000-128,000 metric tonnes of biomass and secure downstream contractual arrangements to ensure the model is financially feasible and investment ready.

The planned outputs of the project included

- Stakeholder consultations, and biomass production and management workshops
- Mapped supply chains for coconut shells, bio-oil, and plantation biomass
- Engineered technical design of integrated bio-energy facility
- Devised investment-ready business plan viable for both debt and equity providers.

The first two have been achieved and improved means of charcoal manufacture have been adopted by small producers. Through a wholesaler (who has also increased business) they supply a main purchaser in Jakarta and a new one in Sulawesi. The produce is presumed to replace fossil fuels, but the participants did not know this. Processing has improved 30% as a result of EEP intervention, which enables prices to local farmers to be increased. Without charcoal production, the coconut waste is simply burned. Employment has increased.

Outputs 3 and 4 were completed, but have not resulted in further developments. Participants pointed out the need for financing to overcome the production bottleneck.

5 Community Energy: Conversion of Cow Manure into Biogas for Energy in Riau

A suitable cow manure digester was built at the Al Muslimun Islamic boarding school with EEP project support. By all accounts the digester worked well and is capable of working sustainably in the future provided it obtains the necessary ongoing cow manure supply.

The government has separately provided the school with the necessary cows and with a shed where the cows can be housed and fed in the afternoons and at night (the cows need to graze in the palm plantations in the mornings), and where the manure can be collected and fed into the biogas digester built with EEP funding support

The digester's fertiliser and biogas are worth about 1.7MillionRp/month in simple financial terms, the key part of the digester's value is the digester's fertiliser which gives better results in the school's palm plantation than the equivalent chemical fertiliser default case.

However the Al Musilman Islamic Boarding School has been struggling to find the necessary full time cow husbandry and cow manure plant operator willing to work for 1.7 Million Rupiah/month plus free housing and even schooling for the operator's children. The reason for this difficulty in hiring suitable operators with such a generous remuneration package is the buoyant local economy with good employment prospects elsewhere for suitable operators.

The project plans to resume operation in 2017 when a new operator will be recruited, when he retires from his current job. He has already been identified and is keen to take up the operator role and take advantage of the free housing provided with the job.

The EEP provided project support and training was rated as good by the stakeholders.

Overall, the project was revealed in the review visits to be a qualified success, with every probability that the new operator to come and work on the project being able to operate the biodigester sustainably into the future.

6 Community Energy: Production of Biogas from Farming Wastes, Pulang Pisau, Kalimantan

This project was led by Yayasan Eka Mandiri, with the crucial development work being undertaken by the R&D Center of the Indonesian Agency for the Assessment and Application of Technology in cooperation with Gapoktan Sumber Rejeki (Farmers' Group Association).

The main outputs of the project were:

- A Power House Training Center to continue socialization and awareness raising on biogas and training as well as promotion of sustainable development based green economy. The building and its complex area is named as "Biogas Training Center" (BTC).
- 10 digesters (4 – 6m^3) distributed to selected target farmers and villages and families trained on the biogas production as well as its utilities for cooking.
- A small enterprise scale (40m^3) biogas systems established in Biogas Training Center (BTC) as a main promotion facility.

The biogas digester was constructed within one year and tested to show it functioned satisfactorily. However the project is not operational and so actual impact has only been through employment on construction.

Neither the community digester nor the household digesters are in use. The household digesters have been rendered redundant by the distribution of LPG stoves and subsidised LPG bottles. The community digester needs a tapioca processing plant to provide its feedstock. The cooperative representative stated a need of 100 million rupiah for the feedstock train, including tractor and fertiliser.

The project has been technically successful, but has not progressed because of social and economic changes in energy delivery (subsidised LPG) at a household level and failure to realise the full production chain of its feedstock for the Biogas Training Centre.

3.4.3. Feasibility studies

The three feasibility studies present a contrast between the well carried out POME project, which is probably on the way to investment, and the Sanitary Landfill gas project, which was poorly designed and was not competently carried out.

7 Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project

This project was led by South Pole Carbon in cooperation with Swastisiddhi Amagra Palm Oil Plant.

The project aims to capture the biogas generated in wastewater treatment processes in palm oil production and use it as fuel to generate electricity for export to the Sumatera grid. This project is fulfilling its specification and is progressing. It has the following characteristics.

- The Palm Oil Mill considered has the necessary in-house POME supply needed.
- The necessary FS (Feasibility Study), and EMMP (Environment Monitoring Plan/Environment Management Plan) are completed, and local government authorisation has been received. The necessary PPA (Power Purchase Agreement) MOU has been signed with the local PLN (electricity utility), and the necessary grid interconnection study had been nearly completed.
- The South Pole EEP funded support was clearly useful to the project.
- The palm oil plant paid for the final completion of the FS – this shows that the project beneficiary was being pro active to get the project actually implemented.
- The palm oil plant was prepared to install the larger conductors (local transmission grid wires) needed in the weak local grid for the necessary power export to take place.
- PLN is clearly motivated to implement the FIT provisions. PLN needs extra power (which it cannot supply any other way) in the area of the palm oil plant.
- The necessary used conductor wire is available to be used, the local poles are strong enough to carry the larger conductors (wires) and the palm oil plant is in a designated development area.
- The project is technically sound, it will use a free fuel (POME), it will reduce anaerobic pond effluent discharges, and it has a clearly motivated proponent. So it is highly likely that the project will have a sustainable operation.

The POME to grid-connected power self-use and export electricity project is not particularly novel per se, but it will still make a valuable contribution as a successful local demonstration project which will be valuable as all demonstrations need to be local for replication to other subsequent projects.

8 Sanitary Landfill Gas for Riau Rural Electricity

This project was led by Universitas Indonesia in cooperation with Universitas Islam Indragiri.

The project was supposed to conduct a feasibility study (FS) to give recommendations on the feasibility of a sanitary landfill gas power plant in Indragiri Hilir, determine project costs and financial sources and identify constraints and barriers as well as critical variables which affect the project success.

From the interviews it was very clear that the project was essentially an academic exercise with no specific outputs that could be used to develop a real implementable project. The following points itemise the main deficiencies.

- there were serious technical deficiencies in the FS because the single landfill MSW/biomass waste cell that was integral to the project concept would not give the steady gas supply needed for any gas engines to operate sustainably over time. The logical approach would have been to have a series of cells, which would have been filled consecutively to produce a 'smooth' output of gas. It is surprising that this standard approach was not used;
- there was a demonstrable lack of local coordination and technology transfer as the Tembilahan City Cleaning Department were unaware of the value of landfill gas and so landfill gas was never considered in the subsequent separately funded DED (Detailed Engineering Design); and

- a diesel generating plant running noisily next to the main road into Tembilahan City was not reported in the FS. This indicates that PLN was short of probably both voltage support and transmission capacity and therefore would likely value new local sanitary landfill based power generation and thus provide a market for the landfill gas produced. It is remarkable that no one noticed these issues in any project review site visits.

9 Comprehensive Commercial Bioenergy Solutions from Palm Oil Waste Streams at Small and Large-scale Processing Facilities in Riau Province, Indonesia

This project was led by STC Indonesia in cooperation with PT Forest Carbon Consultants, Maris Projects, Indonesia Clean Power Ventures and Perkumpulan Elang.

The project aimed to secure legal and financial support for a commercial pilot project for bio-oil, biogas, and/or bio-energy production in Riau Province: it produced business, engineering design, and financing plans for integrated investments in the above facilities.

The project seeks a Low Emissions Development Strategy (LEDS) that generates income for smallholder farmers and reduces the pressure on remaining forest areas. The proposed Integrated Bioenergy Facility (IBF) combines a 10MW biomass energy facility with a 5 tonne per hour bio-oil mill and a biogas recovery system. Biomass is a key component of a Low-Emissions Development Strategy (LEDS): 10MW of renewable energy from palm oil waste biomass represents a 4% increase in local energy production for Riau. The biomass plant would utilise a mix of palm oil trunks, fronds, empty fruit bunches (EFBs), and discarded palm oil fruit as inputs. The outputs of the IBF are 10MW of electricity supplied to the public grid and 5 tonne per hour of high fatty acid crude palm oil (HFCPO) which is a feedstock for biodiesel production.

Among the three technologies investigated, the biomass pyrolysis is relatively unproven for commercial application, especially at the small scale and utilizing oil palm biomass waste as feedstock. A demonstration project (funded by a donor country that could provide expertise) may be able to carry it forward, but this is not apparent at this time.

3.4.4. Community Energy

In addition to the two community energy projects, which involved pilot plants, there were five using either biogas from digesters or cookstoves. The projects using biogas from digesters showed a mixed picture, with one project (Biogas digester for cattle dung at Tangkiling near Palangkaraya, a duplication of work carried out with EEP support by SNV in Central Kalimantan) demonstrating considerable success and one (Cow Manure: Sustainable and Green Energy Development to Support Economy and Community Welfare in Suka Maju Women's Group, Teluk Meranti, Riau, led by ISEC) other almost complete failure. Communal biodigesters require communal solidarity and organisation, as well as essential skills for men and women, who typically perform different tasks in the construction and management. The two projects promoting cookstoves failed. Subsidised LPG is a more convenient alternative at similar cost. There were also technical problems with the stoves, which should have detected and remedied before distribution.

10 Development of Integrated Biogas Energy Demonstration in Pangkalan Bun, Central Kalimantan

The lead applicant was Nature Conservation Education Foundation - YAPEKA (Yayasan Pendidikan Konservasi Alam dan Lingkungan Hidup). However on the ground implementation was undertaken

by Yayasan Orangutan Indonesia – YAYORIN (the Indonesian Orangutan Foundation).

Previously biogas digesters have been constructed in some villages, but have fallen into disuse as local people did not know how to maintain them. This project has brought expertise to local areas and so enabled digesters to be put back into use and new ones built.

YAYORIN is a local NGO and operates only in Kalimantan. The project has met timetable objectives and the digesters are reported as functioning well. The project is continuing and is sustainable, given the skills now gained at local level. The imparting of skills and involvement of the communities has been crucial. The project carried out comprehensive gender monitoring and involved women as a majority of participants. It also reported carrying its work into the Dayak communities, although not the principal participants.

At the district level, there is one office at Baamang, which is reported as having built a digester and bought a generator to produce electricity. This is not yet operational as they are still waiting for storage and other equipment. The evaluation team was unable to visit the office because of the distance involved, but is an indication of sustainability and replication of results.

11 Cow Manure: Sustainable and Green Energy Development to Support Economy and Community Welfare in Suka Maju Women's Group, Teluk Meranti, Riau

This project was led by the Institute Social and Economic Change (ISEC) in cooperation with Universitas Diponegoro (UNDIP) and Suka Maju Women's Group.

- The project aimed to construct 4 communal biogas digesters of 20 m^3 and 1 unit of 8 m^3 in the village of Teluk Meranti, which would result in:
  - Biogas for cooking for 14 households;
  - Bio-slurry (a by-product from digesters) for fertilizer;
  - 58 persons trained on construction of biogas digesters and their operation and maintenance;
  - Small scale industrial/processing activities increasing income from the local agriculture production;
  - Savings in fuels: expenditures of Rp. 23.000 – Rp. 46.000/month/household saved due to reduced use of petroleum gas (LPG) and firewood.

The main program executor, Institute of Social and Economic Change/ISEC, has encouraged the Suka Maju Women's Group to achieve equality for women at a community level. This is through participating in training, thereby improve their capacity. ISEC has provided equal access to men and women for participating in the training on the utilization of bio-slurry, and training to bioreactor users on the usage and maintenance of bioreactor. However, the project did not have the legacy envisaged at the time of evaluation. The following points are pertinent.

- The communal scale biogas did not work well as it was no clear division of implementing responsibility or biogas operators.
- There was low quality standard of installed biogas digesters. Out of four installed communal scale biogas and one household scale biogas digesters three communal scale biogas digesters are no longer working due to leakage and other damage, while the household biogas digester is also suffering leakage. Only one communal biogas digester is in use as a household digester for gas for cooking.
- Due to low price of LPG, people tend to use it rather than biogas for cooking.

- No assistance was given to support the activities of the partners in technical matters. Consequently, minor damage occurred was just left.
- Biogas reactor constructed has not complied with the Standard Nasional Indonesia (SNI 7826).
- The bio-slurry produced from the digesters has been the main product. Regarding the project as one of agricultural improvement with additional biogas might make such schemes viable.

12 Medium Size Biogas Digester at Tangkiling near Palangkaraya

This project was led by SNV Netherlands.

Both the final report of the project and Programme End Impact Assessment (Volume 1) indicate that the project implemented 10 digesters (30m^3 each) serving 84 households. Capacity building was conducted through training for 13 masons and 10 mason's assistants. 84 households (wife and husband) attended the training of how to use biogas and group management of biogas. The beneficiaries also attended training on how to raise the cows, house them in cowsheds and how to use slurry as biofertilizer.

The evaluation team was able to visit one site, which was functioning well, with a digester and six houses connected.

SNV paid considerable attention to mobilisation of the communities and their organisation. This appears to be crucial to enable communal biodigesters to function in the longer term. The project was also continuing to receive support from the provincial Bappeda office.

13 Reducing Deforestation & GHG Emission with Biomass Stoves and Fuel as Alternative Energy for a Community , Palangkaraya

This project was led by Yayasan Inovasi Teknologi Indonesia (INOTEK) in association with Yayasan Mitra Insani, who provided resource persons and contacts.

The project aimed to enable people in two villages to use 100 biomass stoves provided in field trials. The UB.03 Biomass Cylindrical Fuelwood Stove is designed to save firewood that is widely used by households in rural areas. This stove can use various dried biomass such as wood sticks (10-20 cm), briquettes, dry leaves, dry jathropa fruit, and dried candlenut shell. It is manufactured in Indonesia and retails at €16. It was purchased by the project sponsor and distributed free to the households.

The stove table and the burning chamber are stainless steel. The other parts are galvanized plate. The system aims to reduce combustion smoke significantly compared to traditional firewood stove.

Specification (Kopernik, 2016) indicates a combustion efficiency of 38-45% compared to traditional firewood stove of 7% - 10%. Fuel consumption for normal use is 600 grams/hour.

Both villages were visited, where no operation was noticed and people interviewed in one of them. Villagers reported that the stoves were no longer in use as LPG stoves distributed by the government were easier to use and of comparable cost in terms of fuel.

14 Introduction to the High Efficiency Biomass Stoves in the Villages of Indragiri Hilir District

This project was led by Mangrove Indragiri in cooperation with FMIPA and the University of Brawidjaya Malang.

The project distributed 200 biomass stoves to the selected households in four villages. The fuels that could be used included wood chips, wood pieces and logs (of maximum size 2-4 cm), coconut shell, corn husks, leaves or plant residues in or the form of pellet or briquette. The biomass stoves were claimed to produce no (or little) smoke during operation with dry fuel.

Use of the biomass stoves stopped after 3 months for the following reasons.

- Long ignition time, still requiring kerosene or paper for ignition.
- Short duration of combustion.
- There was a lot of smoke, which made breathing difficult.
- LPG has replaced the stoves because of easy access and relatively cheap price due to the government subsidy, or sometimes relatively cheaper charcoal is used.
- There were technical obstacles, such as clogging at grill/grate, perishable firebox and difficulties in cleaning.Still had to spend time getting the biofuel, in comparison with available LPG bottles.

3.4.5. Capacity Building

The four capacity building projects had different foci. One focused on regional energy planning and was well received and is in the process of duplication. One developed new curriculum in technical education, which was also well received and in progress in four locations. A clearing house on renewable energy had gone through its plan, but its impact appears minimal. The fourth project dealing with stimulating renewable energy businesses meets an important need, but was not verifiable.

15 Support for the Regional Energy Planning Process of Riau Province (Rencana Umum Energi Daerah, RUED)

The project was led by Yayasan Spektrum Pelangi in association with the Faculty of Science and Technology of State Islamic University Sultan Syarif Kasim Riau.

The Indonesian government's energy policy calls for the development of Provincial and District/Regency level Energy Development/Master Plans (Rencana Umum Energi Daerah, RUED).

The project trained and assisted the province and 13 districts of Riau in producing energy master plans.

In addition to the planned EEP project's work in Riau, one Provincial and two District renewable energy plans were produced in Central Kalimantan through a separate EEP contract.

The EEP project provided training on the use of the LEAP (Long Range Energy Alternatives Planning System) software, which as part of its training then involved trainees undertaking data gathering for their energy plans, and then the development of the relevant energy plans by the trainees.

The EEP project supported the training of 53 people in energy planning in Riau, who then were certified as Energy Policy Analysts/Planners.

However, there is inherently a high turnover in local officials as they are regularly rotated into new positions, so the sustainability of the trainees' expertise for any future revised renewable energy planning is questionable.

The EEP energy planning was clearly a useful capacity building activity, but is hard to link such training in any meaningful way to any subsequent energy/GHG savings. It is not clear how such wider RUEDs (energy development/master plans) really support the uptake of renewable energy (and specifically biofuels) in Indonesia vis-a-vis fossil fuels.

There will be a probable extension of the training to North Sumatra and West Kalimantan using local resources.

16 Setting up a renewable energy clearing house in Riau Province

This project was conducted by EnReach (Energy Research Center, Riau). Its aim was to set up a 'One stop shop' in the province to provide information on and ways of mobilising renewable energy resources and techniques.

Results as specified in the application have been largely achieved, but somewhat late, and probably not to the top quality. Project objectives focused on RE dissemination. However, means of effective dissemination were not fully dealt with at either design or realisation.

The project was not a priority for provincial and district authorities and did not receive adequate support from them. Only one of the ten districts responded to the offer of training from the project. The result is a small office and library in the university, with staffing support from the university, funded from other activities. It is now operating as a higher education information provider and outlet for academic work, rather than an active coordinator of resources and actions. The final report indicates that effective continuation would depend on long term external funding. which has not been forthcoming. It has not achieved its project purpose, although it nominally continues to function.

Government commitment at provincial level would have been necessary for the wider envisaged remit.

17 Capacity Building and Investment Facilitation for Renewable Energy Project Developers, Palm Oil Plantations and Financiers

The project was led by The Apex Consulting Group - New Ventures Indonesia in association with Yayasan Tambuhak Sinta and Energy Research Centre.

The aim of the project was to increase the business capacity and capability of renewable energy project developers in both Riau and Central Kalimantan to accelerate their ability to develop their projects, access finance, and successfully partner with sustainable palm oil plantation.

Training workshops on renewable energy related business were conducted in Jakarta (4 times), in Palangkaraya, Central Kalimantan (2 times) and in Pekanbaru, Riau (2 times). 15 days of business support on average were provided to the 10 selected project developers (total 150 person-days). The project included networking, partnerships and forum discussion on business,

In their final report New Ventures Indonesia claimed it had facilitated over US$3.1 million (EUR 2.3 million) in investment into Renewable Energy project developers, but this appears to be a general statement rather than a project result. The evaluation team were unable to meet with those involved to verify these statements. However, they must be treated with some scepticism, as the final report of the project states, ‘The renewable energy sector in Riau and Central Kalimantan are both still in the early stages of development. Effectively targeting local stakeholders will require significant resources.’ A follow up meeting for participants was targeted for 2014, but whether this took place is not verifiable.

18 Teaching biomass technologies in technical schools

This project was effectively led by TEDC in cooperation with technical schools in Riau and Central Kalimantan.

The project developed technical training programmes in bioethanol, biodiesel and briquette manufacture. These have been certified at national level. They filled a gap in technician training in Renewable Energies, which already included wind and solar sections. They were piloted in four technical schools.

The work built on previous work on solar and wind power technical training funded through GIZ and ASEAN. Teachers rated the training highly and the equipment was being used in all the schools. Three of the four delivery schools were visited and 143 students were reported on the two year courses. Actual use of the training equipment was witnessed. The training is part of a broader training in energy technologies. The students were reported as mainly gaining jobs as trainee technicians with PLN, the national electricity utility, but there were also reports of employment with timber and biodiesel enterprises.

The training programme has been certified by the government agency. It is therefore part of a curriculum that can be rolled out to 45 technical schools. However, resources need to allocated to do this.

3.4.6. Strategic Studies

The two strategic studies were carried out according to plan, but there appears to be no follow on in Indonesia at this time.

19 Redeemable Biomass Electricity Credits

The project was led by Sinclair Knight Merz in cooperation with the University of Muhammadiyah, Pekanbaru.

The project aimed to develop a way forward for Redeemable Biomass Electricity Concept (RBEC) through a feasibility study. Farmers or villagers would exchange waste biomass in return for vouchers they can exchange for electricity, providing an alternative source of income. The biomass is collected and provided to a power producer for use in the generation of electricity. This helps the generator to secure fuel at a known cost. The electricity produced is sold into the electricity grid or local network and is available to householders. The result would advantage RE in general consumption.

Stakeholders related to this project included: MEMR, PLN (state electricity utility) in Pekanbaru, Riau and Jakarta, funding agencies, project developers and technology suppliers.

The major components for the project were achieved in the time frame:

- Stakeholder Interviews at national level
- Field Visits
- Refine and follow-up information.

This was really an academic study into possibilities, which was carried out competently. An exchange rate of biomass for kWh was indicated, although the variable nature of biomass renders the exactitude uncertain. Alternative means of generation through community, islander or PLN grid were explored. There is no indication of application, which would require either legislation or

contractual agreement from PLN.

20 Developing and Piloting a Platform and Database for Biomass and Bioenergy

This project was led by Wiltrain Oy (Finland) in cooperation with MHG Systems Oy (Finland), World Alliance for Thai Decentralized Energy Association Wade Thai (Thailand), Institute of Indigenous Empowerment LPMA (Indonesia) and the University of Palangka Raya (Indonesia).

This project, aimed at the development of the biomass monitoring and planning platform and piloting it in the selected area in Central Kalimantan.

The project developed and modified from the MHG Feedstock ERP Platform an Indonesia specific and customized Biomass and Bioenergy Resource Assessment Platform. An economic decision analysis tool was developed to help investors to evaluate multifuel biomass strategy alternatives.

It demonstrates for central government cost effective possibilities of modern technology. The project could have substantial long term impact in biomass utilization of all levels, policy making, land usage, buying and selling biomasses and more efficient logistics solutions. The project has not been taken up by the Indonesian authorities or an institution, although such take up is reported is Vietnam and Pakistan.

3.5. Emission figures

There are considerable differences between the emission figures in the Completion Report and those verified by the Evaluation. The table below shows figures determined at the time of the evaluation. The differences with the Completion Report arise for two sources. The Completion Report includes figures that would result from the projects following the feasibility studies and includes numbers from projects, which have ceased to function. Some of the feasibility studies are leading to further investment and development, but this has not yet taken place. Several projects have also ceased to function.

Table 7 Comparison of figures from the Completion Report and the Evaluation with regard to GHG and people involved

GHG emissions avoided (replacement of fossil fuels with renewables) (Tonnes CO2)/Year		**Number of people with access to modern, reliable bioenergy services**		**GWh from renewables for all projects except clear failures***
Reported	**Verified or not disproved**	**Report direct involvement**	**Verified or not disproved**	
1222767	56046	82769	4030	331
				328 (electrical)
				2.4 (thermal)
Cf reported figure	4.6%		4.9%	

* No such calculations are made in the Completion Report. Two projects will never function

because of fundamental failures. These are the dual chamber gasifier and the gas from landfill. They are thus excluded from the calculations for GWh. These figures include all other projects, even those with a low likelihood of moving forward (hence the term 'not disproved' is used). The latter calculation is very approximate, as it has been calculated from methane savings. Nevertheless the orders of magnitude are sufficient to provide a comparison.

In addition to the finance for the renewable energy projects EEP Indonesia organized stakeholder capacity building and strategic studies. To promote information sharing and transfer of know-how and technologies Indonesian delegations, consisting of representatives from the key stakeholder institutes of the programme, have participated in renewable energy conferences in the country and in SE Asia and in Finland.

Training courses, workshops and seminars have included

- 39 workshops, seminars and training events for government agencies, NGOs, research institutes and the private sector involving 1,861 participants in total.
- 46 training courses and workshops involving 1,437 participants.
- for renewable project developers to enhance their capacities in design, formulation of project proposals, project management and administration, monitoring and evaluation and reporting.
- EEP Indonesia Annual Forums in 2012 and 2013 with over 220 participants in each event.

The evaluation team was able to ask people interviewed about their experience of training and other events. Their responses were overwhelming positive. They had no idea whether the event was funded through a project or from central funds. Nevertheless, they were positive about the assistance they got in putting their projects together and keeping them functioning. The technical assistance got good ratings from the successful applicants.

3.6. Results

The reduction of GHG emissions and establishing public-private partnerships were the two main threads running through the EEP approach and the aim was to integrate them in all result areas. In the former regard, as shown above, performance has been poor. In latter regard, the programme has performed well. The section below deals with performance against the outputs of the logical framework matrix.

At the end of each result there is a comment on the result area overall.

Result area 1 - Strengthened knowledge base, know-how and institutional collaboration for renewable energy nationally and in the participating provinces

Verification of achievement was through several indicators. These are set out below.

Indicator	Evaluation
Indicator 1: Institutional, legal and regulatory, and financial barriers to RE, especially bioenergy, production and utilization and best practices of	There are project publications dealing with these areas. In 2012 a baseline study dealing with barriers to the utilisation of RE in Indonesia was produced focused on the two provinces. This is a competent document. It points out the main barriers, some of which have been addressed by the programme. Lack of energy master plans at regency level, which have

Indicator	Evaluation
bioenergy identified.	been addressed in the capacity building project on this topic and by direct contract. • Lack of awareness and enforcement of regulations at regency level. This undermines policy, and was dealt with in the capacity building (above). • Although recent changes have produced a tariff for RE, its regulation may need review. This does not seem to have been dealt with in programme delivery. • Regional government is responsible to develop and implement policy and regulation. This huge task is not supported with adequate resources and capacity. Other than the implemented capacity building for government in both provinces, it is difficult to see what the programme could effectively do about this other than raise it with central government. • Private sector interest in the development of RE resources is limited. There is a lack of reliable energy service companies that could provide support in equipment supply and operation and maintenance service for biogas technology. None of the projects seems to have paid attention to this issue, which is important for the development of RE. • Government-based initiatives have lacked the approach to develop a sense of community in project development. As the consequences, many off-grid/community-based RE development are not successfully put into operation. Unfortunately, the lesson has not been adequately learned and applied in the programme, with similar results in some projects. • Only limited number of NGOs working in energy sector, let alone renewable energy subsector, particularly in Central Kalimantan. This made the work of the programme difficult but it did make efforts to address this through regional workshops and using the networks of national bodies. • The capital intensive nature of RE development and lack of knowledge on RE in local banks and local private financial institutions hinders private sector appetite to invest and/or provide financing for commercial RE development. This was recognised by the programme and formed the focus of one project and an integral part of several feasibility studies. • Lack of capacity in mastering the technology is the main

Indicator	Evaluation
	technical barrier in the development of clean energy initiatives. Suppliers and users have deficits. Specific mention is made of clean stoves and their unsustainable use. Unfortunately, this failing was replicated in two projects. There were two documents on best practices. *Bio-energy for a bright future* is a glossy document, which lists the 20 projects supported by the programme, regardless of their success or not. Thus projects' outputs are presented, which have actually not been achieved and this must have been known at the time of publication. There is also a document, *Review of the Best Bioenergy Practices*, which is volume two of *EEP Indonesia Programme End Impact Assessment*, also produced in November 2014 by the team of four consultants. This document lists eight good practice projects, of which five are from EEP Indonesia and three from other elsewhere. Of the five from EEP, the first two listed are not functioning at this time and have no prospect of functioning. This was a poor choice of projects. Furthermore, this task would most usefully have been accomplished in the first year drawing on existing practices to inform the programme.
EEP Indonesia supported projects/studies linked directly to policy and strategy development at the national and provincial levels	Five projects impinge on this indicator. Yayasan Spektrum Pelangi Indonesia: Support for the Regional Energy Planning Process of Riau Province; this was subsequently replicated at Provincial level in Central Kalimantan. This project directly assisted in the development of strategy at a provincial level and has been positively reported. Two other provinces have requested assistance. ENREACH: Setting-up a Renewable Energy Clearing House (RE information and service center) in Riau. This project has not gained more than formal support from the provincial government and so has limited impact and sustainability. ETC Foundation: Developing Teaching of Bioenergy Technologies at Technical Schools has resulted in nationally verified courses in bioenergy production. Further funding is needed at a national level for this to be rolled out comprehensively. Wiltrain Oy: 'Developing and Piloting a Platform and Database for Biomass and Bioenergy 'aimed at the development of the biomass monitoring and planning platform and piloting it. It has not been taken up in Indonesia, but in other Asian countries. Sinclair Knight Merz: Redeemable Biomass Electricity Credits

Indicator	Evaluation
	aimed to develop a way forward for Redeemable Biomass Electricity Concept (RBEC) through a feasibility study. This has not been progressed.
Indicator 3: Concrete suggestions for improvements.	Suggestions and recommendations are given in the Completion Report. These include those for specific projects, for Indonesian authorities and for MFA. The first and last are dealt with in other sections. There are five recommendations to the Indonesian authorities. • Incorporating RE potential into Regional Energy Master Plans. The means have been developed in the project supported by EEP. • Reduction in subsidies to fossil fuels. • Review of feed in tariffs for RE with regard to fossil fuel subsidies. • PLN to change its off take agreements from a linear to a cascading model. This would have been worth a strategic study. • Directorate of Bioenergy and Provincial (Dinas) Offices of Energy and Mineral Resources to maintain databases of incentives for RE and disseminate them. This demands resources, with ENREACH did not receive for its Clearing House project in Riau. These are largely going with the flow of policy and some are being implemented, such as the reduction on subsidies to some fossil fuels, e.g. kerosene.
Indicator 4: EEP Indonesia supported forums, training events and workshops, at least 15 events/600 participant in these events.	Programme documentation indicates 39 workshops, seminars and training events for government agencies, NGOs, research institutes and the private sector involving 1,861 participants in total. The larger number of events was necessitated partly by the need to stimulate proposals for projects. Given the initial poor response in terms of quantity and especially quality to call one, further efforts were put into stimulating proposals for call two, which involved awareness raising as well as information delivery over the nature of the call. The project participants interviewed had an overwhelmingly positive attitude to the training given. The numbers include 5 workshops and 332 trainees, who properly belong in Result Area 2 Indicator 1 as they are for project development. This would reduce these totals to 34 workshops and 1,529 trainees.
Indicator 5: Website established and functioning, number of	The programme website www.eepindonesia.org been in use since June 2011 and is still functioning. During the project period there were 31,406 visits.

Indicator	Evaluation
visitors at the site.	

The project has achieved this result overall. The regional energy planning process was conducted in Riau involving all districts and repeated in Central Kalimantan, involving just two. Links among research institutions and NGOs have been boosted by project participation and attendance at events. The strategic and regional studies have added to the body of knowledge. However, the knowledge base in the provinces was low and in Central Kalimantan almost non-existent, as the baseline study pointed out.

Influencing policy at a national level on the basis of a small programme is difficult. It is also difficult to attribute the causes of change, when there are so many factors operating. For example, reduction in fossil fuel subsidies is driven by budget needs at government level as well as by the international agreements that Indonesia has entered into.

Result area 2 - Increased public and private financing for RE projects

Indicator	Evaluation
Indicator 1: Training events/workshops organized for project developers on project identification and planning and project development (formulation of EEP project proposals) and management procedures, at least 12 events/200 participants in these events.	Programme documentation indicates 46 training courses and workshops involving 1,437 participants arranged for the renewable project developers to enhance their capacities of renewable energy project implementation (design, formulation of project proposals, project management and administration, monitoring and evaluation and reporting), also renewable energy project finance and fundraising issues discussed in related business forums. As indicated above, the project participants interviewed had an overwhelmingly positive attitude to the training given. The number of participants resulted from casting the net as widely as possible to stimulate proposals. These figures include 5 workshops and 332 participants already counted for Result Area 1 Indicator 4. They properly belong here as the training was for project development.
Indicator 2: At least 80 % of the pre-selected proposals contracted.	First call: 5/8 preselected projects contracted, second call: 15/15 preselected projects contracted; percentage of contracted projects: 87% of the preselected. This indicator was achieved, but at the cost of accepting some poor quality applications. The majority of projects visited were viable and indeed achieved a degree of performance consistent with the application. However two of the applications were patently non viable at a technical level and as many as five more were repeating practices already demonstrated as marginal (at best) in Indonesia.

Indicator 3: At least 5 investments plans deriving from EEP Indonesia supported investment facilitation projects.	The project Capacity Building and Investment Facilitation for Renewable Energy Project Developers, Palm Oil Plantations and Financiers reported 12 business plans. The evaluators were unable to meet with any project participants, in spite of repeated attempts to contact the project lead partner, who was reported as unavailable on the initial suggested dates and then did not respond to other dates or to requests for contacts with the other project partners. Three projects were proceeding with investments at the time of the evaluation.

EEP has had one notable success in getting MEMR support for replication of the project using Human Manure and Domestic Waste for biogas production at Dar El Hikmah Boarding School. The Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project is also proceeding and is likely to get the private sector investment needed. Without being able to verify the Capacity Building and Investment Facilitation for Renewable Energy Project Developers project, it is difficult to say more, but two out of 14 projects going forward for either replication with public funds or investment is a respectable achievement.

More disappointing has been the results of the study on Redeemable Biomass Energy Credits, which has not generated any level of political support. It has been a rather theoretical exercise. The point of having an indicator stating that 80% of preselected projects should be contracted must be questioned. This may have pushed down the quality threshold.

Result area 3: (Pre)feasibility studies which test project ideas on new approaches, technologies and project ideas on bioenergy to provide sustainable and affordable alternatives for energy supply, strategic studies

Indicator	Evaluation
Indicator 1: At least 5 (pre)feasibility studies carried out with EEP Indonesia support.	Seven studies have been undertaken, but one (Sanitary Landfill Gas for Riau Rural Electricity) should not have been funded as it did not produce a report, which could have been appraised by an investor.
Indicator 2: At least 3 (pre)feasibility studies resulting in investments/ bioenergy projects (or MoU or other commitment to an investment or a project).	At the time of evaluation, investment was likely to proceed in the Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project and was proceeding in the Human Manure and Domestic Waste in Dar El Hikmah Boarding School Project. However, this latter was not classified as a feasibility study, but did contain elements of one allowing for an expansion of the pilot.

New approaches, technologies and ideas have come forward, and feasibility studies have been conducted. Although classified as a pilot project, the Dar El Hikmah has broken new ground and is already a successful innovation. The Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project is a success in this category. However, these are the only two, which seem likely to gain further investment. Nevertheless, the project, 'Business Development for Integrated

Biomass Power Production in Central Kalimantan' has actually brought benefits to the charcoal and coconut producers and does have the potential to go forward.

It is a pity that the concept of pre-feasibility was not applied to the Dual Chamber Gasifier and Sanitary Landfill Gas projects. Short studies on these could have demonstrated their shortcomings and either led to improvements or called a halt to them.

Result area 4: Innovative approaches, technologies and project ideas on bioenergy are identified, tested and demonstrated in practice in industrial applications

Indicator	Evaluation
Indicator 1: At least three (3) industrial pilot/ demonstration projects carried out with EEP support.	Four projects have been developed: SaraRasa Pilot from Sago starch, Dar El Hikman School using human waste, Business Development for Integrated Biomass Power Production in Central Kalimantan (first stage of charcoal making only), Conversion of Cow Manure into Biogas for Energy in Al Musilman Islamic Boarding School Riau, and Biogas from Farming Wastes. The dual chamber gasifier was largely constructed but not completed.
Indicator 2: At least 2 viable pilot projects (projects continue/results remain after EEP Indonesia support has ended)	One project will continue. Dar El Hikman school will continue and be duplicated. The first stage of the Integrated Biomass Power Production in Central Kalimantan is sustainable and the project on Conversion of Cow Manure into Biogas for Energy in Al Musilman Islamic Boarding School Riau is likely to develop as specified.
Indicator 3: Switch of 2 000 kW from fossil fuels to renewable energy in industrial applications.	The use of a power figure rather than energy is confusing. Evaluation calculations indicate that a maximum of just over 22GWh may be generated a year in the medium term, which indicates a figure close to 2000 kW. However the current figure is much lower, probably less than 400 kW (thermal).
Indicator 4: New bioenergy electricity production capacity of 2 000 kW established.	When the Swastisiddhi Amagra Palm Oil Mill Effluent (POME) installation comes on stream, this will be accomplished. However, at the time of writing, this has not yet happened.
Indicator 5: At least 30 women in active role in EEP Indonesia projects	40 are reported in the Completion Report. From project completion reports it is possible to identify 6 teachers (Teaching Biomass Technologies at Technical Schools), 5 officials (Support for the Regional Energy Planning Process of Riau Province), 1 manager (Creating Biogas from Sago Starch Industry's Waste Water and Biomass) and a large number of women in projects (705 in total), which would probably justify or exceed this number. However, it is a failure of the project monitoring and evaluation system, that this figure cannot be clearly tracked.

Indicator	Evaluation
Indicator 6: At least 8 communities/1000 households/1000 women benefiting from EEP financed industrial bioenergy applications	Given the failure of the cookstove projects and some of the communal bio-digesters, this figure is optimistic and almost certainly unrealistic. Given, too, the failure to adequately monitor beneficiaries, this figure cannot be proven. Reviewing completion reports produces a figure of 509 men and 705 women, which does not take into account of the six projects without adequate monitoring records. This is a management failure.

The programme has identified and supported Innovative approaches, technologies and project ideas on bioenergy. However, it has fallen short of the indicators specified. Given the circumstances in which it was operating, this is not a condemnation. The low base of development and the short time scale militated against success.

Nevertheless, there has been a failure to track actual development with any degree of accuracy. In particular monitoring the participation of women has been neglected at a central level and on many projects. A few have performed admirably in their involvement of women and monitoring their participation, but this has been a minority operating on their own initiative. There appears to have been no central direction on this matter at any time.

Result area 5: Innovative projects contributing to the development of rural communities are implemented by the communities alone or in collaboration with others (community based applications)

Indicator 1: At least 5 community-based RE projects receiving EEP Indonesia funding (25 % of the total number of the EEP financed projects).	Seven projects were funded, if one includes the school using human waste and the cookstoves, which are essentially for individual use. However, only four were functioning at evaluation, or in the process of starting again, and one of these was reducing to individual biogas digesters rather than communal ones.
Indicator 2: Energy capacity of 80 kW of community based energy projects.	Evaluation calculations indicate a maximum of 11GWh will be generated. This would translate to 1310 kW of power on an hourly basis. However, currently the figure is probably around 80 kW.
Indicator 3: At least 10 communities/500 households/500 women with affordable energy	There are two successful community energy oriented projects, with a reasonable degree of verification run by SNV and by Yayorin. The former reported 10 communities and the latter reported 475 women involved. However the 500 households must be treated with scepticism as there is no adequate monitoring system.

Indicator 4: At least 25 women in active role in EEP Indonesia financed community based projects	Project completion reports often did not have a gender breakdown of involvement. The Completion Report noted 40 women as team members or key contacts. Where they did have this breakdown, it was not possible to determine those in a leading or active role. Nevertheless, given the 705 women involved in successful and less successful projects, achievement of the target is likely.
Indicator 5: At least 10 communities/800 households/800 women benefiting from community based EEP financed projects	As indicated above the figure for households and women must be treated with a degree of scepticism. This is a repeated criticism of the monitoring and evaluation processes of the programme.

Innovative projects were supposedly implemented by rural communities. However, several of these were repetitions of previous failures. This was noted for cook stoves and communal biogas digesters. There was already a history of failure in these applications. The biogas digester projects led by SNV in one case and implemented by Yayorin in Pangkalan Bun in the other took account of the need for strong social involvement and appear not have repeated previous failures (the evaluation team saw only one successful site in each case).

The Community Energy projects did not have a high success rate. Of seven supported, only two were fully functioning at the time of evaluation. The project, 'Cow Manure: Sustainable and Green Energy Development to Support Economy and Community Welfare in Suka Maju Women's Group in Teluk Meranti' was reduced to one effectively household bio-digester and the project, 'Conversion of Cow Manure into Biogas for Energy in Al Musilman Islamic Boarding School' awaited the appointment of an operator. The latter was really a demonstration or pilot project rather than a Community Energy project, as it was run for one organisation, the school.

This is probably the most disappointing result area. It is difficult to justify the word 'Innovation' in this category. SNV were using a tried technology and this was recognised at application stage. The cookstoves failed the innovation test on all counts. One did not function properly and neither of the projects took account of the market, i.e. competition from LPG. The 'Innovative aspects' of the two successful projects were taking full account of the social dimension and putting the effort into developing social solidarity. This was worth doing and lessons should be drawn from it across the entire EEP network. Similarly lessons should have been drawn from the experience of South and East Africa EEP, which has successfully manufactured and even franchised their manufacture. There has been a lack of learning across EEP, which led to failure.

3.7. Answers to the key questions posed in the ToR

3.7.1. Relevance

Are the objectives of the programme consistent with national policies, strategies and priorities?

The objectives of the programme are consistent with national policies, strategies and priorities. However, it should be recognised that the priorities of energy security and access to energy for

the whole population have much higher priorities than the development of renewable energy technologies. The latter is a poor third in the priority list. Nevertheless, in remote areas the three do coincide. The programme thus was endeavouring to meet the priorities specified by concentrating on more remote and rural areas.

How well is the programme aligned with Indonesian development priorities and harmonized with the other support provided for the sector?

The national development policy of Indonesia as well as the regional policies of the programme target provinces aim to increase people's access to energy, promote environment friendly technologies for energy production and improve living conditions especially of local people. This contributes to the conditions for livelihoods and economic development of the country. However, within this there is a contradiction between easing access to energy and promotion of renewable resources. Simple extensions of the grid with electricity generated from fossil fuels and subsidised domestic LPG make investments in RE more precarious. During the programme, individual projects were undermined by both these developments, and effectively rendered non viable.

The results of the EEP Indonesia programme support Indonesia and the two programme target provinces Central Kalimantan and Riau to implement RE development, but in several cases this has been in locations, which have ceased to be remote within the programme period through road or grid access.

3.7.2. Efficiency

Can the costs of the programme be justified by the results?

Given the uncertainty over the follow up of the feasibility studies, this question must be answered with some caution. Two of the feasibility studies are highly likely to produce full size developments. A demonstration project (on using human waste in a boarding school) is already adopted by MEMR as an action to be replicated and supported. The multiplication of this project could justify the whole programme.

However, there are also a number of negative points. The observed outputs in terms of GHG savings and people involved were only 5% of those reported in the Completion Report. Although most projects were viable and continued to function after the funding period (something that is not that common) their impacts were much less than reported and at least five projects were failures.

Decisions not to support some projects would have resulted in a serious project 'underspend' but would have avoided waste and improved the result to cost ratio very considerably. A very rough estimate indicates that the improvement of one person's access to energy has cost € 900. This is exclusively to cooking gas. It disregards any multiplier. This figure includes all those benefiting from training and capacity building. When these are excluded, the cost per person benefiting from cooking gas directly jumps to over €4500, which is expensive. Regrettably, data from other EEP programmes has not been available. However, some other studies are available. A study of village electrification on Timor Leste (Nerini, 2015) indicated a cost of between US$1500 to US$5000 per household for effective connection serving most household appliances. In Brazil (Goldemberg), rural electrification has proceeded at a connection cost of US$1000 per capita.

How well have the intended results been achieved, in terms of quantity, quality and time?

The programme presents a remarkable contradiction in answering this question. Allocation of

funds and support of projects has been very close to target. A majority of the projects continue to function at different levels (some well, others less so). In terms of programme management to deliver projects and get things happening on the ground, the programme has performed well in terms of quantity and time. The difficulty of getting adequate quality applications in the first round produced a major effort to raise awareness, involve potential applicants and support them in the second round.

However, in meeting the quantity and time criteria for implementation, the criterion of quality was neglected. Programme management have admitted that it was difficult to get adequate quality applications from the regions. A majority eventually came from sponsors based in West Java. Their grounding in the provinces was weaker than a project with a provincial lead. This made worse by the short time scales involved and the need to commit the finance to reach administrative targets.

Consequently results in terms of energy generated and people involved have been sub-optimum. At least two projects (Dual chamber gasifier and Sanitary landfill gas) should not have been funded or stopped at an early stage after monitoring because of technical flaws. Several others, dealing with biomass stoves and digesters based on cattle dung, have little innovation, and a history of poor performance in the country.

Nevertheless, the projects reported positively on all aspects of achievement. With respect to quantity, quality and time, a majority reported that they achieved their planned targets**.**

Table 8 How have the results been achieved, in terms of quantity, quality and time? 1 is not achieved to 4 achieved according to plan

Quantity

Not achieved (1)	Partially achieved (2)	Mostly achieved (3)	Achieved to plan (4)
2	3	3	11

Quality

Not achieved (1)	Partially achieved (2)	Mostly achieved (3)	Achieved to plan (4)
4	2	3	10

Time

Not achieved (1)	Partially achieved (2)	Mostly achieved (3)	Achieved to plan (4)
2	2	3	12

Project partners took their own perspective on what could be achieved in the circumstances. They did not consider and could not be expected to consider the overall targets of the programme. The discrepancy with attainment of programme targets is marked.

Quality of technical assistance?

Throughout the project partners were positive about the quality of technical assistance. In terms of facilitating the administration of the project, it performed well. Documents were produced; the response to low levels of application in the first round was quick and appears to have been thorough. However in one regard there is a failure: quantitative recording of gender in project reports is weak or non existent.

Nevertheless, project sponsor and partner views of technical assistance were positive.

Table 9 Project partners' answers to, 'How did you rate the quality of technical assistance?'

Not at all (1)	Somewhat (2)	Quite well (3)	Very well (4)
3	2	3	11

There were no considerable differences among the different groups of projects in any of the above responses.

At a technological level, there is more reason to query the quality. The dual chamber gasifier and the landfill gas feasibility study failed abysmally in terms of technical quality and engagement with the market that they should not have been allowed to continue (It is accepted that their selection by a panel of experts was outside the direct hands of the TA team). Yet the former one was chosen as the flagship project for the programme, with its picture on the cover of the Completion Report and first place in the good practice guide.

There is little quantification of energy in the project documents, whether in joules or kilowatt hours. They deal with tonnes of CO_2 and with power kW, but not with energy, which makes the documentation confusing as this is the essential link between the two.

The overall impression is that project management of inputs took priority over delivery of technical and economic outputs.

Were the stakeholders satisfied with the performance and achievements of the project?

As indicated above, the responses of project participants were positive, as was that of Ministry representatives.

3.7.3. Effectiveness

By how much has the use of renewable energy increased in the target provinces?

As far as the verification could proceed, given limited time, the use of renewable energy increased by up to 22GWh (thermal) per year. The vast bulk of this is charcoal, with 2.4 GWh of biogas. This represents a generating power of 2.5 MW. These figures should now be increasing and an increase to 37 MW is possible if all realistic feasibility studies are carried through.

By how much has the target provinces' populations' access to energy improved?

As far as could be verified, 3300 people should have improved access to energy, which means that they have benefit from cleaner and more quickly accessible thermal energy. Some of this access is indirect, in that they benefit from food prepared on biogas. The figure thus includes 2000 pupils and staff at LKM Harapan Madani School.

How effective has the project been in promoting local government (and national government) ownership of the developed tools and methods?

There have been effects at local and national levels. There has been training on energy planning in Riau at province and district levels. This has been replicated in Central Kalimantan, although not in the original project specification as a further EEP supported activity. Two further provinces, Northern Sumatra and West Kalimantan have expressed interest in this training, which is likely to take place.

Support to the development of Integrated Regional Energy Master Plans (RUED) in the both programme target provinces, Central Kalimantan and Riau have resulted in:

- A provincial RUED for Riau Province and proposals for the 12 kabupaten (district/city) level Energy Master Plans, which make up the province have been drafted.; and
- Draft plans for the provincial RUED and 2 kabupaten (district/city) level Energy Master Plans in Central Kalimantan.

Representatives of Provincial Departments (Dinas Offices) of Energy and Mineral Resources were invited to become members of the Technical Committee of the programme and a joint monitoring approach (monitoring in cooperation with provincial and central government representatives) was applied to the projects financed by the programme.

Records indicate that there were events for awareness raising, training and other capacity building purposes, including Annual Forums, which aimed to be venues for matchmaking between potential investors in renewable energy.

Central Kalimantan province continues to monitor projects and visitors from other provinces have visited some installations in the province. There appears to be 'buy in' from local government in the two provinces. At national level, the project using human waste at LKM Harapan Madani School is now a MEMR supported activity and will be supported in other schools, of which there are many in Indonesia.

To what extent has the programme contributed to the adoption of renewable energy friendly policies regionally or nationally?

It is difficult to give a clear answer to this question. The examples above relate to energy planning and to the adoption of one particular model. The latter is a definite effect at national level. The others relate to regional levels. EEP Indonesia is a small project in a large country and operates at the third priority level (behind energy security and access to energy). These degrees of impact are probably as much as could have been expected at the programme start.

3.7.4. Development impact

To which extent has the project incorporated human rights based approach and the cross-cutting objectives of Finland's Development Policy Programme?

The current MFA Guidance Note on HRBA was issued in 2015 after the conclusion of EEP Indonesia. It indicates that the cross cutting issues (p13) of gender mainstreaming and climate sustainability are crucial means to attain the objective of poverty reduction.

The TOR (p4) for the evaluation indicated that cross-cutting objectives included promotion of gender and social equality, human rights and equal participation opportunities of easily marginalized groups, environment and climate sustainability.

The Completion Report of EEP Indonesia included four cross-cutting issues (p13): environment, gender, combating poverty and good governance.

This evaluation takes the HRBA note as the basis for categories and includes the other aspects under the two main headings.

Climate sustainability is core to the activities of the programme. The projects have increased the use of RE and reduced GHG emissions in their immediate application and contributed to the reducing their overall growth rate. There are also examples of converting waste and human,

agricultural and industrial sewage into energy, thus reducing the pollutant effect of wastewater, which should increase environmental sustainability and have some longer term effect on climate sustainability.

The projects focusing on use of cattle manure for energy generation have paid attention to the role of women, and trained them in maintenance of the systems, a matter neglected (according to respondents) by nationally sponsored initiatives. The division of labour of men in construction and women in maintenance has continued. Nevertheless, women's roles have been recognised and skills gained. Where such systems have remained in use, women have benefited by reduced workload in firewood collection or working with other, often unreliable, sources of energy.

There are no reasons to disbelieve the Completion Report statement that EEP Indonesia has promoted good governance in terms of probity, including a transparent project selection process. All project participants were positive about this aspect. Nevertheless, there have been shortcomings in several respects, notably in monitoring of technical progress and participation of women. The former does not seem to have received adequate attention and in some cases may even run the charge of negligence. Reporting projects as functioning when they are not is bad practice. The failure to monitor adequately the involvement of women at programme level is a major failing.

These have contributed to the overall objective of combatting poverty. In this regard, EEP Indonesia has mostly operated and supported implementation of renewable energy projects in the areas of poor rural communities, and thus a part of activities have directly contributed to poverty reduction. However, its operations have involved the more accessible parts of the rural areas, which would have been difficult to avoid in the time frame. Thus some initiatives have been overtaken by extensions of the grid or availability of LPG within the period since programme closure. Only one of the projects in Kalimantan with local partner YAYORIN was working with Dayak communities, and that not as a prime implementation.

What is the net impact of the project in terms of replacing fossil fuels with renewable energy sources and the awareness of the stakeholders and beneficiaries of the indicator?

As indicated above, the use of renewable energy increased by up to 22GWh (thermal) per year. This would have replaced mainly fossil fuels, primarily kerosene and LPG, and firewood. It is not possible to determine the breakdown between the two sources, but the emphasis is on the former. The latter would also have reduced pressure for deforestation.

The awareness of the stakeholders varied. In some cases, such as Yapeka operating in Kalimantan, central government and academic participants, this was significant. However, for many participants, the financial, agricultural and convenience benefits were crucial.

Does the programme have an impact on the income and/or health of the people (private sector and civil society) affected by the project?

Several of the projects did have an impact on the income and health of the people involved. In terms of income, this was the case from the cattle dung to energy digesters sponsored, the improved charcoal production supported by PT STC, and LKM Harapan Madani School using human waste. The first and last also reported health benefits in terms of avoidance of noxious fumes or smells as did the other two projects using cattle dung.

Several other projects, which are in the process of development, such as Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project and the Cow manure digester built at Al Muslimun Islamic School are very likely to show benefits in the next two years.

The enterprises involved in the project Capacity Building and Investment Facilitation for Renewable Energy Project Developers, Palm Oil Plantations and Financiers, should show benefits from the implementation of business plans, although verification was not possible. Furthermore, the trainees in the technical schools learning biomass technologies will have enhanced skills and employability, although it was not possible to track employment destinations.

3.7.5. Sustainability

What are the possible strengths/weaknesses/opportunities/threats to EEP funded projects' sustainability?

The strengths arise where there is an economic benefit or users find the new means of energy delivery more convenient on a daily basis (this may be cleaner, faster, more reliable or some other aspect) to be gained from the projects. This is the case for LKM Harapan Madani School using human waste, Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project, the Cow manure digester built at Al Muslimun Islamic School, the charcoal producers supported by PT STC and some of the biogas from cattle dung projects, where the slurry is recognised as of greater value. In the last case, social organisation is vital if communal digesters are in use as opposed to household ones.

The most frequent weaknesses arise from inadequate attention to the local social and economic situation and the integration of the community into the project. The two cookstove projects were inaugurated in communities close to all weather roads, on which could be transported 3kg LPG cylinders, which were subsidised. The distribution of LPG stoves by provincial authorities, which were more convenient to use, cleaner and more reliable, at little extra cost consigned the solid fuel stoves to the scrap heap. The Production of Biogas from Farming Wastes in Pulang Pisau failed to recognise that the local community would not see the benefit of manually chopping up the tapioca waste feedstock in the long term. Their other tasks took priority.

The most glaring weaknesses arose from a failure to understand the technical nature of the task, as in the dual chamber gasifier and sanitary landfill gas projects. These could not be completed, let alone sustained.

Opportunities arise from clear advantages leading to replication. The project led by LKM Harapan Madani at Dar El Hikmah Boarding School using human waste is already a priority for replication supported by MEMR. Individual cow dung digesters continue to be rolled out by MEMR. There is interest in copying the charcoal processing systems. The regional energy planning process is a national requirement and the methods of the supported project are likely to be adopted by two other provinces.

Threats arise from competing policies, lack of critical mass and access to finance for small enterprises or communities. It was reported that the subsidy on kerosene has been removed. This has started a greater interest in household bio-digesters according to some respondents. However that on 3kg LPG remains, which reduces or eliminates the incentive to use RE for domestic purposes. Policies on extending the grid and access to it for RE generation can undermine off grid projects. This would have been the case for the dual chamber gasifier if it had been technically feasible. Critical mass and lack of access is a threat to extending charcoal production from coconut waste. There is surplus supply of feedstock and adequate demand, but there is a production bottleneck, which needs small investment. The same applies to training in bioenergy. The three techniques of briquettes, bioethanol and biodiesel are taught in different schools, where the

equipment is located. It is thus not possible to deliver a comprehensive bioenergy training programme, which would produce technicians skilled in most aspects of bioenergy. The development of this sector is thus hindered by a continuing skills shortage.

Have these factors been adequately considered in the planning and implementation of the projects?

This is a specified question in ToR, and is interpreted here as being the factors involved as strengths, weaknesses, opportunities and threats above. In principal they involve economic advantage, convenience to users, social acceptance, technical soundness in operation and financial viability in the short term. The first three can be considered as the market aspect, the fourth is the technology aspect and the fifth is the finance aspect.

In the case of the most successful projects, all three aspects (market, technology and finance) have been considered in balance and a development path determined. This applies to the projects: KM Harapan Madani led project at Dar El Hikmah Boarding School using human waste, Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project, the Cow manure digester built at Al Muslimun Islamic School, the charcoal producers supported by PT STC and the cow dung digesters sponsored by SNV. Full consideration of finance has enabled Al Muslimun Islamic School to identify the financial limits and postpone operation until an operator can be found, who makes the project financially viable. The charcoal producers have moved partly along the development path by improving their production techniques, although finance for the full plant is not yet available. SNV have paid most attention to the social aspect of the communal digesters, noting that this requires considerable effort for success.

Capacity building projects need to address the factors of economic advantage, convenience to users and social acceptance to ensure adequate delivery. There is less emphasis on technology, except in the case of the technical training in bio-energy. However, continuation of the activities is dependent on future financing, the likelihood of which should be expressed at the application stage. Although not on a large scale, this has been forthcoming for bio-energy training and is reported for the Regional Energy Planning Process (RUED) of led by Yayasan Spektrum Pelangi.

The factors noted above are specified in the evaluation grid for selection of projects. This includes sections on:

- Project / business idea or concept and logic, including criteria on benefits, soundness of technology or mechanism, monitoring and evaluation
- Impact, ownership, sustainability, replicability and spread, including impact on energy access and savings and income generation, technology feasibility and management capacity
- Innovation, learning and dissemination
- Budget, cost-effectiveness and financing
- Management / Resources / Partnership

The above are broken down into sub-criteria, which if observed form a reasonable basis for selection. A criticism is that when broken down into sub-criteria of 3% or 5% of the total, it would be possible to let through projects, which were not technically viable, but promised much in terms of impact, because they would get high scores on enough non technical criteria. A set of core criteria and a minimum quality level might be considered to avoid this eventuality.

Such a checklist cannot avoid failure. There is always a risk, otherwise the activity would have

already happened. For example the technically competent project, 'Energy resource Platform & database,' sponsored by Wiltrain Oy in Central Kalimantan. The project would have enabled remote sensing to track changes in biomass on the ground. The need for commitment from an Indonesian institution and policy support was recognised, but it was not forthcoming. This could not have been known at project start. The technique has been replicated in other countries, including Pakistan and Vietnam, but not in Indonesia. Consideration of the factors greatly increases the likelihood of success, but does not guarantee it.

In several other cases, these factors have not been adequately considered. The two cookstove projects should have considered the road network and discussed provincial policies on LPG fuelled stoves. The market advantages were weak when competition was considered. There were also technical problems with the stoves, principally lack of insulation to ensure enough heat was retained. With the exception of the SNV projects, the other projects generating biogas from communal cow dung digesters have had to revert to household digesters as social commitment was not forthcoming. In the cases of both types of projects, the national situation on LPG and the history of communal bio-digesters was known.

The Teaching Biomass Technologies at Technical Schools project has produced a nationally certified curriculum. Training modules and material have been validated by experts from the ITB (Institute Teknologi Bandung), Research Institute for Industrial Crops (Plantation Research Center in Sukabumi in West Java (BALITRI), Indonesian Institute of Sciences (LIPI) and the small-scale industries in Yogyakarta .

The dual chamber gasifier and sanitary landfill gas projects did not adequately involve the local communities and institutions in terms of determining availability of feedstock, demand as well as having technical failures.

Will the benefits produced by the EEP programme be maintained after the termination of external support?

The benefits of the projects, continuing at the end of the programme period will largely be maintained. At this stage, projects have sorted themselves out. Some will continue as they bring benefits to the participants. These are stated above. These include one pilot project (Biogas Development of Human Manure and Domestic Waste in Dar El Hikmah Boarding School), three arising from feasibility studies (Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project, Conversion of Cow Manure into Biogas for Energy Al Musilman Islamic Boarding School, Riau and Business development for integrated biomass power production in Central Kalimantan), two community energy projects (Development of Integrated Biogas Energy Demonstration in Pangkalan Bun, Central Kalimantan and Biogas digester for cattle dung at Tangkiling) and two capacity building projects (Teaching biomass technologies and Support for the Regional Energy Planning Process). Some will be replicated. A further three projects were still delivering some activities or under consideration as a feasibility study, but at a relatively low level (Cow Manure: Sustainable and Green Energy Development to Support Economy and Community Welfare in Suka Maju Women's Group, Teluk Meranti, Setting up a renewable energy clearing house in Riau Province and possibly the feasibility study Comprehensive Commercial Bioenergy Solutions from Palm Oil Waste Streams at Small and Large-scale Processing Facilities in Riau Province, Indonesia). The short term benefits of the cook stoves and processing of tapioca waste are already past. The benefits of some, such as Teaching Biomass Technologies at Technical Schools and Capacity Building and Investment Facilitation for Renewable Energy Project Developers, Palm Oil Plantations and Financiers have longer time horizons, as their impact is through the expertise and application of those trained. MEMR have already stated that they will no longer support

communal bio-digesters from cattle dung. However, they are promoting the example of Harapan Madani School using human waste at a national level.

Impacts on regional policies and practices are difficult to determine, as much lies in the attitudes and behaviour of officials involved. They face two constraints: the regular and customary turnover of staff into other departments and the small budget allocation for energy support at the provincial and district levels. Nevertheless there is expertise in Regional Energy Planning in both provinces and at district level.

Who will take over the responsibility of financing the activities, or have they become self-sustaining?

With the exception of MEMR support for school based digesters of human waste, the activities are self sustaining or have ceased.

What is the potential for scaling up the business activities of the EEP funded projects and how could this potential be supported and replicated in the future?

The following projects could be scaled up or replicated.

Already in process:

- Integrated Biogas Development of Human Manure and Domestic Waste in Dar El Hikmah Boarding School.

Likely from own resources:

- Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project.
- Communal digester in Boarding School Al Muslimun.

Needing some further investment and market development in line with feasibility study:

- Business development for integrated biomass power production in Central Kalimantan making charcoal from coconut waste.

These projects can be developed, but will need attention to the social dimension to ensure communal commitment:

- Development of Integrated Biogas Energy Demonstration in Pangkalan Bun, Central Kalimantan.
- Market Introduction of Medium Size Biogas Digester supported by SNV.

3.7.6. Programme management and administrative arrangements

How cost effective have the administrative arrangements been in comparison to the results achieved?

As indicated above, the programme presents contradictory information in this regard. 20 projects have been supported and good liaison with government agencies was maintained. At the time of writing a majority of the projects (11) have been and continue to function or are under consideration for development. However three (Cow Manure: Sustainable and Green Energy Development to Support Economy and Community Welfare in Suka Maju Women's Group, Teluk Meranti, Setting up a renewable energy clearing house in Riau Province and possibly the feasibility study Comprehensive Commercial Bioenergy Solutions from Palm Oil Waste Streams at Small and

Large-scale Processing Facilities in Riau Province, Indonesia) must be considered in a parlous state. In terms of administration to deliver projects and get things happening on the ground, it has performed effectively.

However, in terms of getting results from the projects, it has been less effective. The Completion Report presents a misleading picture of GHG savings and people involved as it includes what would happen on the completion of activities following feasibility studies. This is a projection several years into the future. It also includes results from projects, which have delivered no outputs. Results in terms of energy generated and people involved have been sub-optimum. At least two projects (Dual chamber gasifier and Sanitary Landfill Gas for Riau Rural Electricity) should not have been funded or stopped at an early stage after monitoring because of technical flaws. Several others, dealing with biomass stoves and digesters based on cattle dung, have little innovation, and a history of poor performance in the country.
As indicated earlier administration of inputs seems to have taken priority over delivery of technical and economic outputs.

As indicated earlier, the selection criteria used by three experts for project selection included the crucial points on technological soundness, social acceptance and financial viability. An examination of the comments by the three experts does reveal some misgivings over the projects mentioned above. These were reported to the Steering Committee on 5 June 2012.

The Dual Chamber gasifier had the following comments:

> Expert 1: 'How are the targeted local people involved in the preparations… funding info confusing……The project has risks'.
>
> Expert 3: 'Total project's cost seems too large.'
>
> The Steering Committee: 'Some issues to address [7 in total]….(c) technically it can be produced…(e) make sure this project will not do a research engine'.

The Sanitary Landfill Gas for Riau Rural Economy attracted the following comments:

> Expert 2: 'The involvement of a local partner is a necessity.'
>
> Expert 3: 'Very small beneficiaries and too general. No partners involved. Unclear installed capacity'.
>
> The Steering Committee recommended partnering with a local university [not municipality] but with a final report aimed at local investor.

Biomass Stove for indigenous community of Indragiri Hills also had sceptical comments

> Expert 1: 'The lead applicant is not convincing. Same idea and mistakes as in project …'
>
> Expert 3: 'Biomass supply and ownership not clearly elaborated. One of the risk related to biomass utilisation is their long run availability.'

Other comments on the above projects were more positive. Nevertheless, the judgements were mixed and with some warning issued. The Steering Committee did take these into account and made remarks, which in the first two cases do not seem to have been followed up seriously, as the first project was not technically feasible and the second did not produce a plan for an investor.

There was a failure of monitoring and on going evaluation by project management. Among the high spending profile of the programme, the lowest spending areas were monitoring and evaluation at 90% and supervision meetings at 85%. Spending was monitored and supported, but

achievement of goals in terms of energy generation, GHG emission reduction, participation of women and disadvantaged groups received minimal attention. There are no figures in some of these areas and in some others projections have been used. This is a fundamental technical failure.

Were possible problems in implementation adequately addressed?

Programme management has admitted that it was difficult to get adequate quality applications from the regions. Eight projects were chosen from the 40 applications of call one, closing on 26 September 2011, as being capable of going to contracting. However, it was reported to SVB on 11 January 2012, that, 'Based on the results, none of the proposals was totally complete but each proposal still requires at least some improvements (amendments, justifications, revisions).' Corrective action to improve the submitted projects was taken promptly and further action taken to increase the number and competence of future applications. This involved meetings in the provinces and in the capital. Contacts and networks in the consulting and academic communities were used to stimulate applications.

A majority eventually came from sponsors based in West Java. Their grounding in the provinces was through intermediaries and sometimes focused on testing ideas, which were academic rather than directly relevant to the provinces.

The short time scales involved and the need to commit the finance meant that implementation focused on disbursement to viable rather than quality projects. In two cases, viability was not achieved. It was probably not possible to implement the programme as specified in the two provinces in the time available, because there was a lack of competent organisations, especially NGOs focused on energy, and especially in Central Kalimantan the capacity of the organisations needed to improved, which is a long term task. Where other organisations were involved (such as local universities or national NGOs), they needed time to develop the regional and local links. Informal village committees needed to be either convinced of the benefits or set up. For example, SNV in promoting their project, 'Market Introduction of Medium Size Biogas Digester' originally targeted the Palangkaraya district in Central Kalimantan, but could not find initial involvement from the local communities and so moved their activities to Pulang Pisau. They later did enable development in Palangkaraya, at the end of the programme period. The interdependence of awareness, demonstration and organisational capacity is vital as each aspect reinforces the other. There were deficits in all three aspects, which indicates a long time frame to get to a base level, where project delivery can be reliable. In this case, it was not because the basic social, economic and political circumstances were not ready at the beginning of the programme.

How transparent and predictable has the use of funding been?

The selection criteria are clear and the feedback from project participants has been positive on project selection and reporting. There has been a lack of identification of beneficiaries by gender and ethnic group, which makes assessment of reaching women and minority groups problematical.

3.8. Relevance to energy situation in Indonesia

The EEP project was highly relevant to the energy situation in Indonesia, where government policies support access to energy and increased deployment of renewable energy (although this must be regarded as the third priority after energy security and access to energy). The government of Indonesia has ambitious targets for: increased contributions of renewable energy (RE) in the

energy mix; increased energy (electricity) access; reductions in energy subsidies; and reductions in GHG emissions. Indonesia has large currently no or low value “waste” bioenergy resources, which could contribute towards these targets.

The Indonesian energy sector has the following underlying context that supports the increased deployment of RE: (a) petrol and diesel subsidies have been reduced, largely as a result of Indonesia moving from being a major oil exporter to a net oil importer from 2004; (b) prices of (most) LPG has risen to be closer to international prices as Indonesia moved from being a world-leading exporter from 1976–2006 to begin importing sizeable amounts of LPG from 2018; (c) the electricity sector is lacking in generation capacity, and investment remains low and slow due to low energy tariffs combined with challenges in permitting, licensing, land acquisition, and environmental approvals; (d) the 84% electrification ratio in 2014 is low relative to those of its neighbours and in many smaller grids and rural areas, supply is limited to a few hours a day; (e) the national medium-term development plan for 2015–2019 aims to expand electricity access to 96% of Indonesians, which will require significant private sector investment; and (f) there is a Ministerial Regulation that the state owned electricity utility (PLN) has to buy RE based electricity under a favourable Feed In Tariff (FIT) pricing regime.

However, the energy constraints relevant to the EEP project are: (1) that 3kg domestic LPG cylinders remain heavily subsidised and this seriously undermines the attractiveness of “clean/efficient” cookstoves and household biogas options; (2) it can be difficult to get PLN to actually sign supply agreements under the FIT so it is generally very hard to sell RE based electricity to PLN in practice; (3) PLN tariffs for low use households are around IDR 800 (US 6 cents or EUR 5 cents) per kWh so these households expect alternative (incl. stand-alone RE based) electricity supplies to be provided at similar low prices (i.e. the household willingness to pay is in this 5 Euro cents/kWh price range); (4) PLN is under on-going pressure to extend its grid coverage, so what may be an unserved remote area can suddenly have a new grid connection which will then totally undermine the sustainability of any new stand-alone RE-based electrification project; (5) biomass “wastes” are only free when there is no demand for them, create a demand and any RE plant will then have to pay for its “waste” biomass feedstock; and that (6) creating a new biomass based electricity generation project is a serious technical, financial, ownership and management undertaking that cannot realistically be successful when led by project proponents who lack the necessary proven technology at the relevant scale, lack the full mix of skills, experience and expertise needed, and do not have the necessary project funding in place before any construction starts.

Many of the EEP supported projects had their relevance diminished or even completely undermined by the EEP project in Indonesia not taking account of the above energy facts. It is surprising in three years of project operation that such fundamental RE relevance issues do not appear to have been identified or acted on in the EEP project. For example: (i) there is no recognition in EEP final project literature that the financial value of biogas is only really relevant for large non-household users using larger than 3kg cylinders and that the primary economic benefit of most biogas systems is the organic fertiliser produced and not in the biogas; (ii) there was no apparent consideration of the risk of grid expansion to the location of stand-alone RE plants (this happened twice in the flagship PT Dyna Energy gasifier project); (iii) there was clearly inadequate attention given to the need to get a signed FIT agreement from PLN before a project got too far advanced (and certainly before physical construction started as happened in the flagship PT Dyna Energy gasifier project); (iv) project proposals were funded who clearly lack the necessary proven technology at the relevant scale, lacked the full mix of skills, experience and

expertise needed, and did not have the necessary project funding in place before any construction starts (the flagship PT Dyna Energy gasifier project); and (V) several papers or academic studies (e.g. Redeemable energy credits, Carbon market benefits, and Review of best bioenergy practices). They were funded directly to set the programme context, for promotion or as projects.

were funded that were highly unlikely to lead to any tangible result on the ground.

Although the projects fitted well with national policies, there was a much poorer fit with actual instruments supporting development. Taking all the projects reporting, the mean figure for policy alignment was 3.8 (of a maximum 4), while that for fitting in with other supporting measures was 2.0 (compared to a random mean of 2.5 for the scale).

There were also differences among the groups.

Table 10 Mean scores for the different groups of projects with regard to fit with other support provided

Pilots & feasibility studies	Community Energy	Capacity building and strategic studies	All projects responding
2.3	1.4	1.7	2.0

3.8.1. Effectiveness

Effectiveness has two aspects:

- delivering the programme
- achieving programme results.

In the first aspect, performance has been effective. Allocation of funds and support of projects has been very close to target. In terms of programme management to deliver projects and get things happening on the ground, the programme performed well.

With regard to the second aspect, the judgement is less positive. Although a majority of the projects have been and continue to be viable, too few have been able to deliver adequate programme results in terms of GHG reductions and people involved.

The community energy projects have been largely disappointing. With the exception of the SNV supported project, communal biogas activities have largely been abandoned for household ones. The cookstoves are no longer used. The SNV and Yapeka projects appear to have successes, as far as could be verified from the two sites visited, but the other two biogas projects are well below par. The two schools using biogas (from cattle and human waste) are progressing, but only one (Dar El Hikmah Boarding School) is actually functioning at the time of writing. The second (Al Musilman Islamic Boarding School) is recruiting an operative to work the system. This person has been identified, but not yet taken up post.

As stated earlier the Completion Report includes figures for GHG reduction and involvement of people, which will follow from the completion of the projects arising from the feasibility studies. This has done the programme no favours and should have been avoided. A comparison between these figures and those observed during the evaluation, produces output figures of around 5% for both indicators.

Project promoters and partners recognised the problems of effectiveness.

Table 11 Responses of project participants to two questions on effectiveness

How effective has the project been in promoting government ownership of the developed tools and methods?

Not at all(1)	A little(2)	Quite good(3)	Very much(4)
6	8	3	2

Has the programme contributed to the adoption of renewable energy friendly policies regionally or nationally?

Not at all(1)	A little (2)	Quite (3)	Very much(4)
7	9	2	1

Overall these scores are low, with a mean of 2.1 with regard to promoting government ownership and 1.8 with regard to contributing to the adoption of renewable energy friendly policies. The Community Energy scores were the lowest in both categories at 1.6 and 1.4 respectively.

3.8.2. Efficiency

As with effectiveness, efficiency has two aspects:

- delivering the programme
- achieving programme results.

With regard to the first aspect, the judgement is positive. The MFA financing of projects involved €2,116,205, which is close to envisaged €2,201397[2] in the programme document and represents an implementation rate of over 96%. This is in spite of delays in starting, as a result of delays in completing the programme contracting with the service providers, and the difficulty of gaining enough quality proposals in the first round, when only five were funded. It takes into account the extension of the programme.

Total budget realisation was €3,920,210, which was 95% of the allocated amount. Technical Assistance (TA) was €1,089,430 compared to an allocated €1,150,701, also 95%. TA represented 27.8% of total expenditure, which is close to that envisaged.

However with regard to the second aspect, the picture is more negative. A commitment of 94% of programme funds has led to 5% of outputs specified in the Completion Report. Even so, this represents a cost of €900 for each person involved (excluding the project developer's contribution)[3], which is not enormously high, but does become so, when only those benefiting on a daily basis from the energy provision are taken into account. The cost then reaches €4,500 per person, which might be justified for access to electricity, but not simply gas for cooking.

Efficiency in achieving outputs was going to be difficult given the programme base in just two provinces and only in bio-energy. Nevertheless, programme management seems to have only paid attention to delivering the programme in terms of utilising all inputs. More restraint in funding projects would have improved the cost to benefit ratio considerably. Evaluation suggests that a more rigorous selection procedure would have reduced the number of projects and funds

2 These figures are drawn from Table 4.1 of the Completion Report (p28). They differ slightly from the breakdown presented in the same report on page 10 and referred to earlier in this report in Section 3.1.

3 This figure should be treated with considerable scepticism, given the paucity of data available, but should not be out by an order of magnitude.

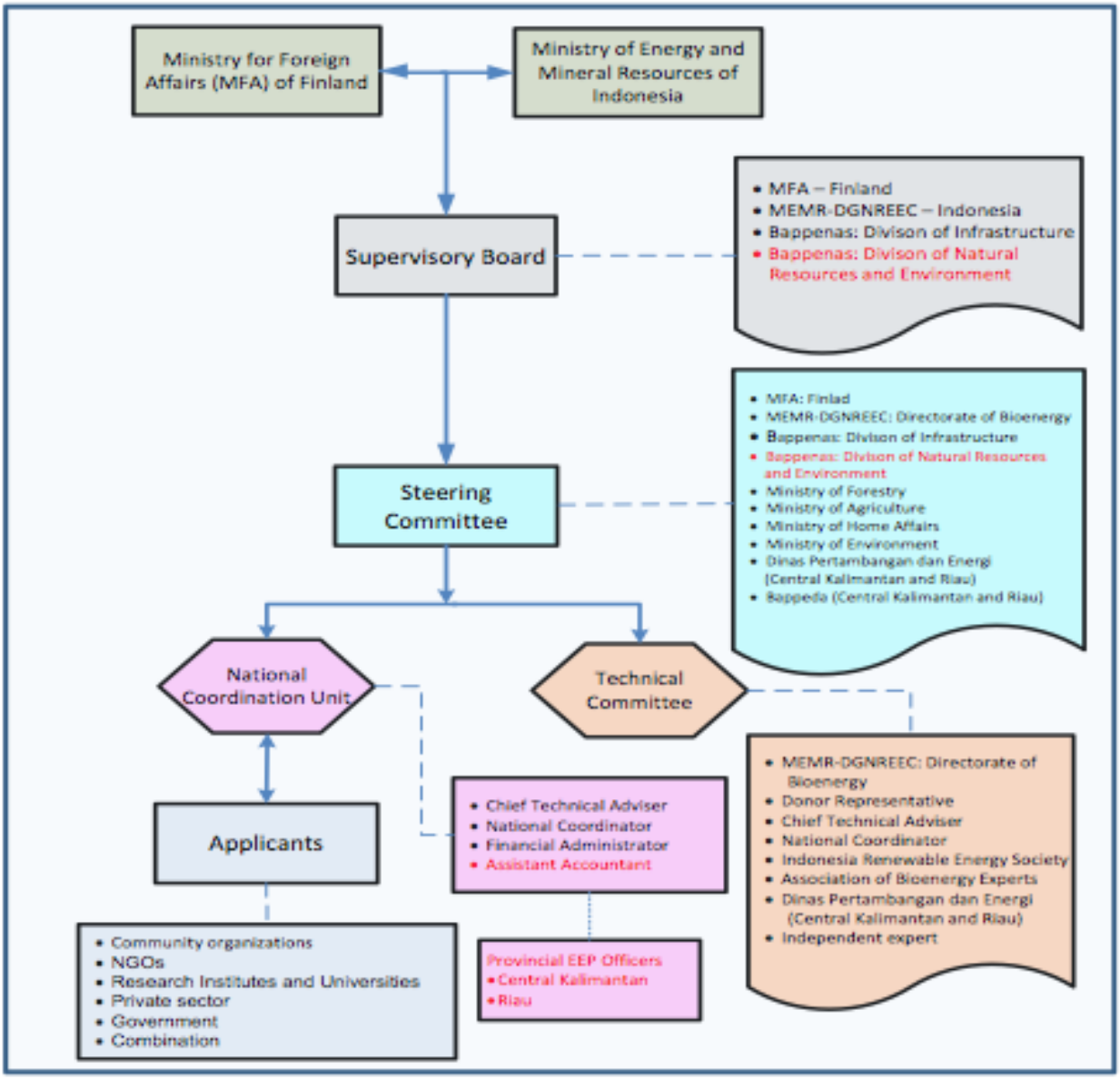
disbursed without reducing results in the key areas.

Nevertheless, as pointed out above, most projects reported positively on all aspects of achievement. With respect to quantity, quality and time, a majority reported that they achieved their planned targets.

3.8.3. Implementation process and management

The EEP Indonesia organizational structure, applied since the beginning of 2012, is set in the figure below.

Figure 2 Organisational chart for EEP Indonesia



Source: Programme Completion Report

The National Coordination Unit (NCU) was responsible for the operational and financial management of the programme. Initially it consisted of the Chief Technical Advisor (CTA), the

National Coordinator (NC) and the Financial Administrator (FA). The CTA and the NC positions were funded through the TA budget, which also supported short term consultancies and support staff in the programme target provinces, who were employed from 2012.

The structure itself has been used in several programmes, in which the evaluation team has been involved. It is not fundamentally flawed. However, with meetings at six month intervals for the Steering Committee (SC) or annually for the Supervisory Board, it is dependent on accurate reporting from the National Coordination Unit. In terms of outcomes, this was deficient. The deficiency applied to achievements in terms of energy produced or GHG saved and to the involvement of women and disadvantaged groups. Members of the SC and SvB should have insisted on getting reports on these two indicators in terms of figures actually achieved and not projected.

The programme was amended five times.

- In January 2012, it was agreed to invite representatives of the Division of Natural Resources and Environment of the National Development Planning Board (BAPPENAS) to the SVB and NC. It was also agreed to fund provincial officers in the provinces and an extra member of accounting staff.
- In June 2012, minor budget changes were agreed.
- In June 2013, the Logical Framework and the Risk Management Plan were amended.
- In February and September 2014, the programme was successively extended. In the first occasion there was an addition to the TA budget and in the second case there were no additional costs.

The first call for proposals was conducted in 2011. It was launched at events in July 2011 at Palangkaraya in Central Kalimantan, where there were 30 participants and in Pekanbaru in Riau, in connection with the energy sector workshop of the University of Riau, with 200 participants. Out of 40 applications, eight were pre-selected for further development and five projects were contracted in April – May 2012. It was reported to SVB on 11 January 2012 that none of the proposals was totally complete and each proposal required amendments, justifications or revisions. The NCU proceeded to assist the applicants to complete their proposals.

The lack of good quality applications necessitated promotional, awareness raising and support actions to stimulate further and better quality applications in the next round. The second call for proposals was launched in February 2012 and 48 were received by 30 April. 15 projects for the EEP finance were presented to SC meeting on 5 June 2012 and contracting undertaken from late 2012 to early 2013. All pre-selected projects were contracted.

There was difficulty in stimulating proposals of any quality from the provinces, especially Central Kalimantan because of a lack of experience and expertise in making such applications. There was also a lack of knowledge of English among potential participants, which was verified by the evaluation. The appointment of staff in the provinces and strong promotional efforts aimed to overcome this. This was successful in raising the number and quality of proposals, but comments from former staff indicate that neither quantity nor quality reached levels desired. The reservations of the experts and the requirements of the Steering Committee on some projects have been reported earlier.

Nevertheless, contracting was undertaken successfully. This was reported as being onerous and consuming of staff time in the project and the MFA as each project had to agree a contract using the rules of the Government of Finland. An extra financial officer was necessary in the project, but

funds were disbursed and projects proceeded. In this regard the programme was very successful.

Project monitoring was undertaken by provincial staff and those in NCU. All projects reported several visits. Monitoring of progress was conducted satisfactorily, but less attention seems to have been paid to achievement of results, which could be realistically achieved. There was a failure to monitor the participation of men and women in the programme, with several projects not reporting on this matter at all. This was a failure at operational and policy levels, given the importance attached to the participation of women in Finnish development policy.

3.8.4. Impact and Sustainability of results achieved

The use of renewable energy has increased by up to 2.5 GWh per year (thermal), mainly replacing fossil fuels, primarily kerosene and LPG, and also firewood at the time of evaluation. This figure is highly likely to increase to 3.5 GWh (thermal) with the doubling of capacity at El Hikmah boarding school and the putting into operation of the digester at Al Muslimun Islamic School, which can be expected within two years.

In addition the Swastisiddhi Amarga Palm Oil Mill Effluent project is progressing according to the feasibility study, so it is on track to add 2 MW electrical to generating capacity. The medium term (3 year) impact is therefore of the order of 22 GWh per year.

Several projects have had an impact on the income and health of people. In at least five cases, either or both of these effects can be demonstrated or are very likely in the next two to three years. The projects include the improved charcoal production supported by PT STC, LKM Harapan Madani School using human waste, Swastisiddhi Amagra Palm Oil Mill Effluent (POME) to Electricity Project and the Cow manure digester built at Al Muslimun Islamic School. In addition the SNV and other projects, which have developed gas digesters using cattle dung, show benefits in terms of income or health.

The project *Capacity Building and Investment Facilitation for Renewable Energy Project Developers, Palm Oil Plantations and Financiers* should show benefits from the implementation of business plans, although verification was not possible. Furthermore, the trainees in the technical schools learning biomass technologies will have enhanced skills and employability. This will be especially the case if the technical schools gain funds to fully equip their classrooms with demonstration equipment. The training of staff in the provinces and districts in energy planning should also bring benefits to delivery in the longer term.

The demonstration projects currently underway will continue under their own financing and are thus sustainable. This will also apply to at least two feasibility studies, which are progressing to the next stage. MEMR has decided to promote and support the projects of the type undertaken at LKM Harapan Madani School using human waste.

Project partners showed a realism over the difficulties of making an impact in answers to three questions.

Table 12 Project partners views of development impact

Has the project/programme incorporated women and disadvantaged minorities?

Not at all(1)	A little (2)	Quite (3)	Very much(4)
3	6	7	3

The Community Energy projects scored highest on this with a mean of 2.9 compared to 2.0 for all

the other categories. They included one project directed specifically at women and another targeting women for training in biogas digester maintenance.

Have fossil fuels been replaced?

Not at all(1)	A little (2)	Quite (3)	Very much(4)
9	5	2	3

Pilots scored highest on this, but still with a mean of only 2.2, as two of the projects were not functioning at the time of evaluation. Capacity building and strategic studies had a low score of 1.2, which was a result of non take up of the study results and the slow effects of capacity building measures. Community Energy projects had a low score of 1.9, the result of three projects, which have effectively ceased to function.

Do you feel that people's health or quality of life has improved as a result of participation in the project?

Not at all(1)	A little (2)	Quite (3)	Very much(4)
10	5	2	2

The results mirrored the responses on replacement of fossil fuels, with pilots scoring best at 2.2 and Community Energy only registering 1.9 (minimum possible score 1.0 and maximum 4.0).

Several projects have failed to bring any significant or lasting impact. Of the rest some will continue as they bring benefits to the participants. These are stated above. Some, such as the Regional Energy Planning, the bioenergy training and the business planning may bring considerable benefits or fade. It is difficult to track these impacts as they are conveyed through the expertise of the people involved. There is a regular turnover of staff and the redeployment of staff to non energy activities. As the numbers dealing with energy matters are small, expertise is vulnerable to erosion.

Impacts on regional policies and practices are difficult to determine, as much lies in the attitudes and behaviour of officials involved. Nevertheless there is expertise in Regional Energy Planning in both provinces and at district level. At national level, the example of the LKM Harapan Madani School has produced a policy change. On a broader or grander level, it is difficult to determine other policy impacts.

The Completion Report is correct in stating, 'Regardless of the scope and the limited duration of the programme EEP Indonesia and projects financed by it have already increased access to renewable energy and also reduced growth rate of GHG emissions locally.' There is also a greater spread of expertise on different aspects of bioenergy and some good demonstration projects.

3.8.5. Cross-cutting objectives

Of the cross-cutting objectives of climate and gender the programme was primarily concerned with climate. Projects have increased the use of RE and reduced GHG emissions in their immediate application and contributed to the reducing their overall growth rate. In using waste products, they have also combatted pollution.

With regard to gender, the big gap in the programme is the lack of adequate monitoring the involvement of women and men at the project level. An analysis of the completion reports of the 17 projects delivering to people shows that only five projects had clear actions to involve women.

Six projects had no record keeping of gender.

Table 13 Projects recognising, promoting and recording women's involvement

Clear actions to involve women	Recognition of gender equality	Record keeping	Total Projects
5	11	11	17

More detail is given in Annex 8.

Excluding the pupils at Dar El Hikmah, there were 705 female beneficiaries and 509 male. 475 of the women were recorded in the Development of Integrated Biogas Energy Demonstration in Pangkalan Bun, which had several outreach activities and recorded female participation in detail. Six of the projects had more male than female beneficiaries, while four had more female beneficiaries. In six there are no records. It is therefore not possible to draw firm conclusions about female participation, but the lack of attention to women's empowerment is not consistent with Finnish policy on this matter.

Nevertheless, some projects have paid particular attention to the role of women. The projects focusing on use of cattle manure biogas generation have noted the need to train women in the maintenance of the systems. The division of labour of men in construction and women in maintenance has continued, with larger numbers of men being trained. Where such systems have remained in use, women have benefited by reduced workload in firewood collection or working in cleaner cooking conditions.

Although the programme has focused on provinces with poor rural communities, its operations have involved the more accessible parts of the rural areas, which would have been difficult to avoid in the time frame. Most regrettably, all the projects in Kalimantan dealt with Javanese or Balinese transmigrants (admittedly often very poor people) and only one also worked with Dayak communities. Given the history of conflict and exclusion in Kalimantan, this was an omission.

3.8.6. Coherence with development goals

The programme has been consistent with Finland's development goals, which focus on poverty reduction, and human-rights based approach. Access to energy may be considered as an essential element in poverty reduction and therefore implicit in the human rights-based approach to development.

Implementation of EEP Indonesia has aimed at good governance in the energy sector, mobilisation of private-sector investments, creation of green job opportunities and development of local expertise.

The programme has increased people's access to energy and promoted green, environment friendly technologies for energy production in the programme target provinces and at the central level in Indonesia.

Living conditions of participants from rural communities have improved. The cross-cutting objective of gender equality has not received adequate priority. Gender monitoring has not been adequate. Implementation has not effectively extended in Central Kalimantan beyond the transmigrants from Java and Bali, who make up less than 20% of the population. The HRBA Guidance note recommends that preceding the programming and planning there should be systematic consultations with women and relevant vulnerable and marginalised groups. There is

no evidence that this took place or that the programme took it into account.

4. Conclusions and recommendations

4.1. Overall performance

The overall performance is assessed in the PESTEL context and then programme management and operational issues are dealt with.

4.1.1. Policy

Renewable energy is given a political priority by the Government of Indonesia. However, this is a poor third to energy security and access to energy. In remote locations the three priorities can work together, but in less remote locations there is a conflict. This occurred in the programme, where grid development or subsidised LPG reached locations were projects were being developed, providing more convenient and sometimes cheaper energy sources.

The Regional Integrated Master Plans represent a way of resolving some of these clashes and the programme supported developments in two regions. However, the programme did not take adequate account of the priorities for access to energy in making some its project funding and this was effectively wasted.

There were attempts by the programme management to widen the programme to either other regions or to other RE technologies. This was resisted by the MEMR, as exploration of options in bio-energy was their priority. The provinces were chosen because of their high bio-energy potential. This makes sense, but the difficulty of stimulating enough viable projects in the provinces was not sufficiently taken on board.

4.1.2. Economy

The Indonesian economy continues to grow and to demand more sources of energy. GHG emissions are growing and the Programme only aimed to reduce the rate of growth. Given its size this was a realistic expectation.

Fossil fuels continue to be subsidised either directly in case of LPG or indirectly through electricity pricing. This makes introduction of RE difficult and in some cases not financially viable. The Government of Indonesia is committed to reduce the subsidies and this happened during the evaluation period, when the subsidy of Rp1000 per litre (28% of market price) on kerosene was removed.

There is a Feed in Tariff (FiT), which gives opportunities to energy generators. MEMR Regulation No. 4 of 2012 indicates a rate of Rp 975 -1722.5/kWh for biomass installations below 10 MW, dependent on location and whether connected to low or medium voltage network. The electricity tariff (2013) per kWh varies from Rp 415 to Rp 1342 depending on circumstances of residential, commercial and industrial and capacity. The FiT is therefore attractive. However, the main incentives seem to be for local energy provision, in terms of bio-gas and also local electricity generation. In remote locations, local production for RE is an alternative to diesel or collecting firewood. However, remote locations are receding in these two provinces. The business planning project led by Apex sought to develop business plans and introduce investors into RE field. The programme supported this and also a strategic study on electricity credits and several feasibility studies for larger developments.

Given the economic situation, the programme had to look for remote locations, in which it was not fully successful, or support specific initiatives, which would lead to investments later. This was a reasonable choice but ran the risks of attracting the most marginal projects. Proposals, which

could attract commercial finance were likely to be doing so already, so those making applications would include a high proportion of early stage ideas, which are inherently riskier, or ones that had difficulty getting finance because of the risks involved.

4.1.3. Social

Operating in the context of the human rights based approach, the programme needed to pay attention to poverty reduction and gender equality and access to energy for the most remote rural areas. In the former regard it is consistent with Indonesian government policy, which also declares equality of the sexes.

The community energy projects which should have addressed both issues were not notably successful. In their design and functioning not enough attention was paid to communal solidarity and commitment. The successful SNV project worked with Balinese transmigrants, with a culture of cooperation in farming and also promoted a legal structure to the cooperation. YAYORIN also operating in Kalimantan noted the need to involve and train women in digester maintenance, which had been neglected in government initiatives. The Islamic schools in Riau also showed good attention to the social and cultural aspects of generation. Yet several of the communal biogas digesters either ceased to function or became household resources. More attention should have been paid this aspect.

The role of women was not given the prominence needed and gender monitoring was inadequate, so it has not been possible to determine an overall picture for the participation of women in the programme. Excluding one regional and two strategic studies, 17 projects should have kept records of the involvement of men and women. The completion reports of six projects show no gender monitoring. Only five projects had clear actions to involve women. The two cookstove projects were targeted primarily at women and extolled the benefits of the stoves to women and children. Yet it was the women, who decided to stop using them. The Maju Women's Group in Teluk Meranti have ceased to use most of their cow manure digesters.

In many projects, women are a small minority of the beneficiaries and no special regard was taken of their situations. However, this was not always the case; the project led by Yapeka, with Yayorin as local implementer, 'Development of Integrated Biogas Energy Demonstration in Pangkalan Bun, Central Kalimantan,' undertook thorough actions to involve women and recognised their crucial roles in keeping bio-digesters working. The vast majority of their beneficiaries were women. Of the five projects taking special actions to involve women, two are continuing in a viable state; two have ceased and one is much reduced.

In spite of the few projects, which recognised the needs of women, the performance of the programme in this regard has been poor. Gender monitoring should have been obligatory from the start and monitoring visits should have reinforced this. The programme has not lived up to the requirements of Finnish Government policy with regard to the involvement of women.

4.1.4. Technologies

The programme promoted some traditional technologies: biogas digesters, cookstoves using solid fuel, landfill gas and charcoal making. However, these were all more sophisticated technologies than those in use in the more remote villages, where firewood remains a standard base for cooking. It also supported some new initiatives using sago, palm oil and tapioca waste in new situations. These were all modifications of proven technology, and success or failure hinged on technical competence, economic advantages and involvement of the appropriate parties. Some digesters worked well, some of the waste-to-energy processes have good prospects and some not.

The failures are in some ways more instructive than the successes. The cookstoves lacked insulation to retain adequate heat, as well as being overtaken by LPG stoves. The landfill gas feasibility study was not carried out technically competently, failing to consider the division of the landfill into separate cells for continuous generation of gas. The tapioca waste plant worked perfectly well and has been visited, but no arrangement was made to mechanically process the feedstock. Small technical improvements could have made a difference and provision of this kind of support should be considered during project implementation for future programmes.

At the other extreme was the dual chamber gasifier, which was a technological leap in scale from laboratory to practice of 1: 500. This size jump would never be considered in industry for testing or prototyping. There were also technical failures in determining the nature and processing of the feedstock and clean up of the gas produced to feed into a generator. As the programme was looking for projects that would stand out as successes, this should have been scrutinised continually, especially as two experts expressed reservations and the Steering Committee made several comments on its viability.

4.1.5. Environment

Changes in GHG emissions have very roughly calculated as up to 56,000 tonnes CO_2 per year on the same basis as is used in End Programme Impact Assessment (Volume 1), which includes methane emission avoidance, and provides the basis for the Programme Completion Report. This is far less than 1.2 million mentioned in the Completion Report, which includes emission reductions, which would arise from the completion of projects following feasibility studies. As projects do arise from some of the feasibility studies, this figure will go up. The programme is thus reducing the rate of increase of GHG emissions, but not by a large amount.

Biogas is displacing LPG and firewood in some schools and households. Improved charcoal producing is reducing emissions and bringing in coconut waste that would otherwise be burned, but there are no noticeable effects on land use.

The programme is in line with Finnish and Indonesian policies and making a small contribution.

4.1.6. Legal

A legal structure seems to have helped community based generation in the project supported by SNV. The contributions, ownership and distribution were defined. In other situations, a lack of legal structure seems to have hindered developments. This probably applies to waste from energy projects, where waste gains a value and attitudes to it change.

4.1.7. Management and operation

The management and operation of the programme shows two contradictory aspects.

In terms of programme management to deliver projects and get things happening on the ground, the programme has performed well in terms of quantity and time. The difficulty of getting adequate quality applications in the first round produced a major effort to raise awareness, involve potential applicants and support them in the second round. This involved the employment of support officers in the provinces and an extra finance officer. This response to the situation was commendable. It was also sensible to try to get the project broadened either geographically or technologically.

In spite of these efforts, it was difficult to get adequate quality applications from the regions. A majority eventually came from sponsors based in West Java. Their grounding in the provinces was weaker than a project with a provincial lead. This was made worse by the short time scales

involved and the need to commit the finance to reach administrative targets.

Consequently results in terms of energy generated and people involved have been sub-optimum. Two projects (Dual chamber gasifier and sanitary landfill gas) should not have funded or stopped at an early stage after monitoring because of technical flaws. Several others, dealing with biomass stoves and digesters based on cattle dung, have little innovation, and a history of poor performance in the country. Their funding is probably explained by a low quality threshold to ensure funds were allocated.

Monitoring was carried out and assistance given in project implementation. However technological oversight seems to have been lacking. The dual chamber gasifier and the landfill gas feasibility study failed abysmally in terms of technical quality and engagement with the market that they should not have been allowed to continue. Yet the former one was chosen as the flagship project for the programme, with its picture on the cover of the Completion Report and first place in the good practice guide as well as a visit from the new ambassador.

The failure to broaden the programme base and the decision not to extend it made delivering the programme to the necessary quality impossible if the quantity targets in terms of projects and expenditure were to be met. The TA should have reported this and not allocated funds to projects, which were almost certain to fail. Reporting outputs that are predicted is bad practice, especially on the basis of incomplete projects. This applies to the Good Practice Guide and to the Completion Report.

However, it is recognised that most of the funded projects remain functioning (11/20, but some only just) and that there have been benefits to communities and enterprises in the two provinces. However these are at a much lower level than was reported.

4.2. Lessons learned

There are a number of lessons, which can be learned from this programme, which have a bearing on EEP and other programmes and have insights for Indonesia.

The EEP concept leads to practical and demonstrable projects, which bring benefits to localities and provide lessons for others. There are several good projects funded in this programme, which are worthy of wider publicity. Learning from other EEP programmes would have been useful. The programmes have a large body of knowledge, which could have been tapped during the Indonesia programme. For example the South and East Africa programme has a prize winning project on of cook stoves, whose manufacture has been franchised. This could have informed both the selection and management of the two projects supported by this programme.

There should be mechanisms to strengthen the links and mutual learning among EEP programmes. This could be through an annual forum, which could be physical and virtual. It would also have been useful to have a representative on another EEP programme participate in the selection of projects and also give an input into the Mid Term Review.

In managing a programme it is necessary to take account of the entire policy context and analyse it at programme inception. RE and reduction of GHG emissions is not the top energy priority for Indonesia. Other policies run across it and projects, which are likely to fall into this conflict should be avoided. The main example during this programme has been the spread of LPG for cooking, which has resulted from government policy.

Involvement of local stakeholders is vital and establishing good working relationships with them over the long term brings good results. Although the project sponsors based in West Java might

not have been as connected with the provinces as desired, they enabled the programme to actually function and produce some good projects in both provinces.

Developing links with and gaining project proposals from remote areas demands time and resources. This programme did not reach the most remote communities in central Kalimantan because time was against it. Development programmes for remote areas need longer times. Starting from the low base recognised in the baseline study, Barriers to Renewable Energy Production, the development path need to raise awareness, build networks and competence and also identify resources before there was a base solid enough to reliably carry out projects of the type funded.

There are still needs to develop initiatives in both provinces and capacity building had only just started. Many of the involved project developers have been newcomers in the renewable energy sector or small local enterprises or NGOs.

In developing and supporting projects, it is important to consider both social and technological matters. Given that project sponsors will tend to have leaning in one of the directions, strong support is necessary to ensure that projects can succeed socially and technologically. All projects need to pass an essential economic test of likely sustainability at the application stage. There should also be a technical quality threshold, below which projects cannot be supported. These two should represent quality tests, which must be passed regardless of scores on any other aspect.

The programme maintained good relationships with the Ministry of Energy and Mineral Resources of Indonesia, through

- Directorate General of New, Renewable Energy and Energy Conservation (Directorate of Bioenergy) at the central level; and
- Departments (Dinas offices) of Energy and Mineral Resources in the target provinces.

Such good relationships are vital for any programme.

Financial completion of a programme should not take priority over technical fulfilment. The Completion Report states, 'It was foreseen at the early stages of the programme that utilization of the entire budget for execution of bioenergy projects only in the two target provinces of EEP Indonesia would be very challenging.' It also recognised that it 'limited the final quantity, quality and diversity of the proposals and implemented projects.' There is a strong impetus to spend all the money, out of a tradition that such money is better spent than not and to show that TA is delivering its full programme. However, in this case, the quality standard was set too low for assessment of projects and money was simply wasted. Furthermore, there seems to have been little technical oversight. Clearly non viable projects were allowed to proceed and actually given wide publicity. EEP programmes have technical, economic and social requirements and outputs. Neglecting the first undermines the other two.

4.3. Recommendations table

Recommendation	Justification
1) The EEP approach should be continued in other parts of the world.	The EEP approach produces a range of clear benefits for participants even under difficult circumstances.
2) EEP programmes should have regular interaction through annual or bi-annual forums	There is clear potential to learn from others' experiences at project and programme level. This will avoid repeating mistakes and capitalising on learning.
3) Representative(s) from other EEP programmes should participate as experts in selection processes.	Such representatives could be especially useful to new programmes or new TA.
4) Representative(s) from other EEP programmes should make an input into the Mid Term Review of a programme.	This would add a grounding of experience to the review, which external evaluators probably do not have in depth.
5) When contextual or operational difficulties make programme delivery of an adequate standard impossible, the TA should be required to report this to SvB and such consideration should become part of the normal reporting procedure, i.e. an essential component of the annual progress report. The reasons can then be determined whether contextual or operational.	The main difficulty of this programme arose from an inability to deliver enough quality projects in the areas and time available.
6) MFA should make it clear that such a report will be treated as a warning of difficulties rather than an indication of failure.	There is a tendency on the part of the donor body and the implementing body to ensure that funds allocated are spent. This arises out of the budgeting process and cannot be changed. However simply spending money because it has been allocated is a waste.
7) Project selection should include minimum quality thresholds for technical and economic viability.	Some projects were not good enough in these regards.
8) Programme management should take care to monitor all aspects of funded projects, taking into account, the specific concerns of the Steering Committee and the experts assessing them at regular intervals. Where lacks show themselves, support should be offered. If the lack cannot be resolved, the project should terminate.	The Steering Committee and some experts expressed concerns about a number of projects, which do not to seem to have received attention during monitoring. A number of projects supported failed to take account of necessary technical, economic and social context elements.
9) Annual progress reports should include clear sections on the participation of	Monitoring in this regard was poor.

Recommendation	Justification
women and disadvantaged groups in the programme. Such recording should be mandatory for all projects supported by EEP.	
10) The Mid Term Review of EEP programmes should include the requirement to address the technical performance and competence of the projects being supported.	The prominence given to two technically unfeasible projects (Dual chamber gasifier and Sanitary Landfill gas) indicated a low level of technical awareness, which could have been rectified early in the programme.
The Completion Report made a number of recommendations, of which the following are endorsed by the evaluation and applicable to programmes in other parts of the world. Other recommendations specific to Indonesia and the end of programme period are not included below.	
11) It is recommended that programs distributing grants to support investments in construction of remarkable renewable energy projects should be reserved a longer duration, at least 5 - 6 years.	The short duration of EEP Indonesia (from April 2011 – December 2014) limited the impact of the program and weakened sustainability of its results. Investments especially in RE based electricity production take time also due to time-consuming permits (construction and environmental permits etc.) and required Power Purchase Agreements.
12) The evaluation would add that such a programme length would also be suitable for programmes aimed at remote locations, because of the time taken to make appropriate contacts and understand the cultural situation.	The project period was not sufficient to build up the level of expertise in the provinces, especially Central Kalimantan. The need to build awareness, networks, capacity and find resources from a low base takes more time than 4 years.
13) It is recommended that the donor agency should accept lump sum contracts for this type of grant programs. These contracts would be easier to manage by each party. Payments, e.g. in 3 – 4 instalments, could be made against milestones defined beforehand in the contract.	Project developers considered requirements given in the Financing Contracts for the project finance (payments against realized costs proven by related receipts) of extreme cumbersome. The procedure also employed the NCU staff making financial monitoring very time-consuming and possibly distracting from technical oversight.
14) It is recommended that the format for project proposals and reporting should be simple enough and respond to the background of project developers. The logical framework approach should be applied to the EEP programme's own planning and reporting only.	EEP Indonesia, as other EEP programs, required project developers to apply logical framework to their project proposals. However, it became evident during the programme that the business life, especially SMEs, and small local NGOs are not familiar with this approach. This resulted in a necessity of extra mentoring both at the phase of project proposal formulation and reporting.